FRIDAY, APRIL 13, 1883.

THE NEW YORK STATE SURVEY.

SOME of the readers of SCIENCE are doubtless familiar with the work of the state survey of New York, and will be interested in the reports of its progress, which will be published from time to time for the information of our readers. But the work has been going on so quietly that many are unacquainted with the history of the survey, and the scope of its work. It is therefore as an introduction to occasional reports of progress that we publish a short sketch of the survey.

Several governors of New York had in vain called the attention of the legislature to the importance of such a survey. In the autumn of 1875 the matter was taken up by the American geographical society, which caused an investigation to be made into the character of the best existing maps. Having found them grossly erroneous, and productive of grave practical evils, the geographical society appointed a committee to secure, if possible, the necessary legislation to organize a state survey. This resulted in the passage of a law, organizing the survey under the direction of commissioners, who appointed Mr. James T. Gardiner, formerly geographer of the U. S. geological survey, to be director.

The first work of the director was a thorough examination of the evils which the state survey was expected to remedy; and his plan for the work is based on the results of this inquiry.

The report for 1876 showed that "although the boundaries of eleven counties, having over sixty corners, were examined in whole or part, yet only two corners were found marked with any authentic monuments. . . . The northwest corner of Albany county was originally marked by a dead hemlock-tree. This disappeared many years since, and no monument indicates the spot where it stood. A few old blazed trees alone remain as evidence of the western line of Albany county. . . . The original north-east corner of Montgomery county was a stake in a cultivated field. It has disappeared, and nothing marks the point."

Concerning local and private surveys, the observations and recommendations of the report are of importance to the whole country. It says: "The want of a permanent system of landmarks, whose distance and direction from one another are exactly known, renders positions of all lines very uncertain. Starting-points from which the surveyor is expected to begin his work are very often in doubt by many feet: he has, therefore, no object in running lines accurately, as it is evident, that, if the initial point of a survey is wrong, all points on the lines will be wrongly located, even when chaining and compass work are absolutely correct. . . . An examination of the present method of surveying lands must convince any engineer that its necessary imperfections are the principal sources of those annoying and expensive quarrels and litigations about boundaries with which all land-owners are painfully familiar. These troubles are by no means peculiar to American experience. Perishable landmarks and imperfect surveying have produced uncertain boundaries in every civilized country. Throughout Europe and India this evil has been perfectly remedied by basing all land-surveys upon a system of permanent monuments located by accurate triangulation. We must continue to waste force and money in quarrels and lawsuits over uncertain lines, until we apply the only cure which civilized Europe has found permanently satisfactory."

The accuracy of the best maps of the state was next tested, and they were found to represent the towns from one to three miles from where they really are. "If the purpose of maps is to describe truthfully boundary-lines, towns, and topographical features, as they actually exist on the earth's surface, then the maps of this state are proved to be false witnesses; and the sooner their character is known and condemned, the earlier may improvement be looked for."

The report proceeds to show that a sufficient remedy will never be applied through the exer-

tions of local authorities, or the enterprise of private map-publishers: "The radical difficulty with our modern surveys lies not in want of capacity, integrity, or ambition among the local surveyors, but in the want of a system of lines measured with absolute precision, and permanently marked, which can be made a base of all surveys, and can furnish checks at short distances, and keep errors within certain well-defined limits."

A trigonometrical survey of this nature, whenever completed, will be used in a great variety of ways, entirely independent of any topographical mapping that may be founded upon it. In pursuance of this policy, the survey has been confined to trigonometrical work.

The triangulation is based on that of the U. S. coast and geodetic survey, which had been extended across Massachusetts to the Hudson; certain stations on the Hudson River series of coast-survey triangles having been connected both with the New England and Fire Island bases. Comparison of results from these different lines of measurement shows that the positions of points overlooking the Hudson River valley are known with great exactness, and may therefore be used as starting-points for most accurate surveying.

The lines of principal triangulation are being pushed into the settled parts of the state as rapidly as possible, in order to set tertiary stations for use of local surveyors, wherever property is most valuable, and to save boundaries whose loss seems imminent. Principal stations being once established, the subdivision in smaller triangles, and determination of public boundaries, can proceed at separate places whenever demanded by the exigencies of special regions, and can be done at the expense of individuals, towns, and counties.

The Hudson valley is already well supplied with principal stations by the U. S. coast survey. The state survey has therefore planned to lay out a series of principal triangles extending from Albany westward through the central and western counties of the state; and another from the lower part of the Hudson, through what is known as the southern tier of counties. The first of these, or the central series of triangles, begins at the coast-survey stations, Rafinesque and Helderberg; the first being north-west of Troy, and the latter west of Albany on the Hudson River. The distance between these points, which is the base of this system of triangles, is about 36,966 metres. The triangulation beginning at the Hudson runs westward, spanning the valley of the Mohawk River, and the valleys which continue this great depression westward across New York. Along the shore of Lake Ontario, from Oswego to Buffalo, the U. S. lake survey has measured a small but accurate chain of triangles, a part of their main chain along the lakes. With this lake-survey triangulation, the scheme of the state survey was connected south of Oswego; the distance between the lake-survey stations, Victory and Clyde, being the joining line, and, in fact, forming a base from which work was begun on the western part of the state-survey chain, before connection was made with the Hudson River section.

The measurement of the angles of the larger triangles is done with 12-inch horizontal circles divided by Troughton and Simms of London. One of them was, however, mounted by Fauth and Co. of Washington. The Fauth theodolite has three reading microscopes divided to seconds, and a telescope of 23 inches focal length with object-glass of $2\frac{1}{2}$ inches diameter. The Troughton and Simms theodolite has two reading microscopes divided to seconds. The angles of the smaller secondary, and of the tertiary triangles, are measured with 8-inch Troughton and Simms circles with two reading microscopes divided to seconds. These instruments have also vertical circles divided and read in the same way as the horizontal.

A complete system of trigonometrical levelling is carried on in connection with the secondary and tertiary triangulation, the zenith distances being observed with the 8-inch circles. Measurement of the horizontal angles of each class are repeated until the probable errors are within the limits prescribed by the U. S. coast survey and the British ordnance

survey. The secondary stations along the Mohawk valley are from four to seven miles apart. Where tertiary work has been done, the stations are from half a mile to a mile distant from each other.

In the matter of marking stations, the New York survey has departed widely from the method of the U. S. coast survey, which has preserved its points by burying in the ground within eighteen inches of the surface a pot, jug, or other object, leaving no surface mark whatever. The state-survey stations are marked by sinking a hole five feet deep, in the bottom of which is placed an earthen pot of truncated-cone shape, with centre mark, and stamped with the letters 'N. Y. S. S.' The earth is rammed about and above this for about four inches. A granite monument six inches square by four feet long is then placed in the hole, and its centre adjusted over the pot. The upper extremity of the stone, which projects above ground, is dressed, and the same letters and the number which designates the station are cut deeply into it. Diagonal grooves on the top of the stone mark its centre.

The monuments are of one pattern, and from a single quarry. These stones, deeply embedded in the earth, are very difficult to move or destroy without the perpetrator of such an act being detected. They are easily found by local surveyors or others wishing to identify the points. The action of freezing and thawing unequally on the north and south sides of the stones will eventually throw them over toward the south. Any disturbance of this kind can be detected by the edges being out of plumb; and the stone can be recentred over the pot, which, being below frost-line, can never move. In addition to the deeply buried pot and stone, two witness-pots are buried from twelve to eighteen inches deep, and three feet from the station. On their tops are stamped arrows which point to the station.

The work of the survey is carried on by a director and a permanent corps of trained assistants divided into three parties, — two for observing angles of the primary and secondary triangles, and one for signal-building. Assistant O. S. Wilson, formerly of the U. S. northwest boundary survey, and Assistant Horace Andrews, jun., formerly of the U. S. coast survey, have charge of the observing parties; and Assistant O. H. Bogardus, of the signal-building party. In addition to the regular force, from six to nine heliotropers are employed in summer. During the winters the assistants are engaged in reducing the results, and the preparation of maps and reports, in the offices of the survey in the state capitol at Albany.

In the bill providing for the expenses of the state government, an annual appropriation of $15,800 is now made to carry on the survey.

This sketch of the causes which brought about the New York state survey, the purposes for which it was instituted, its guiding policy, its plans, grade of precision, methods, and organization, is essential to a right understanding of the results of the work whose progress will be described hereafter.

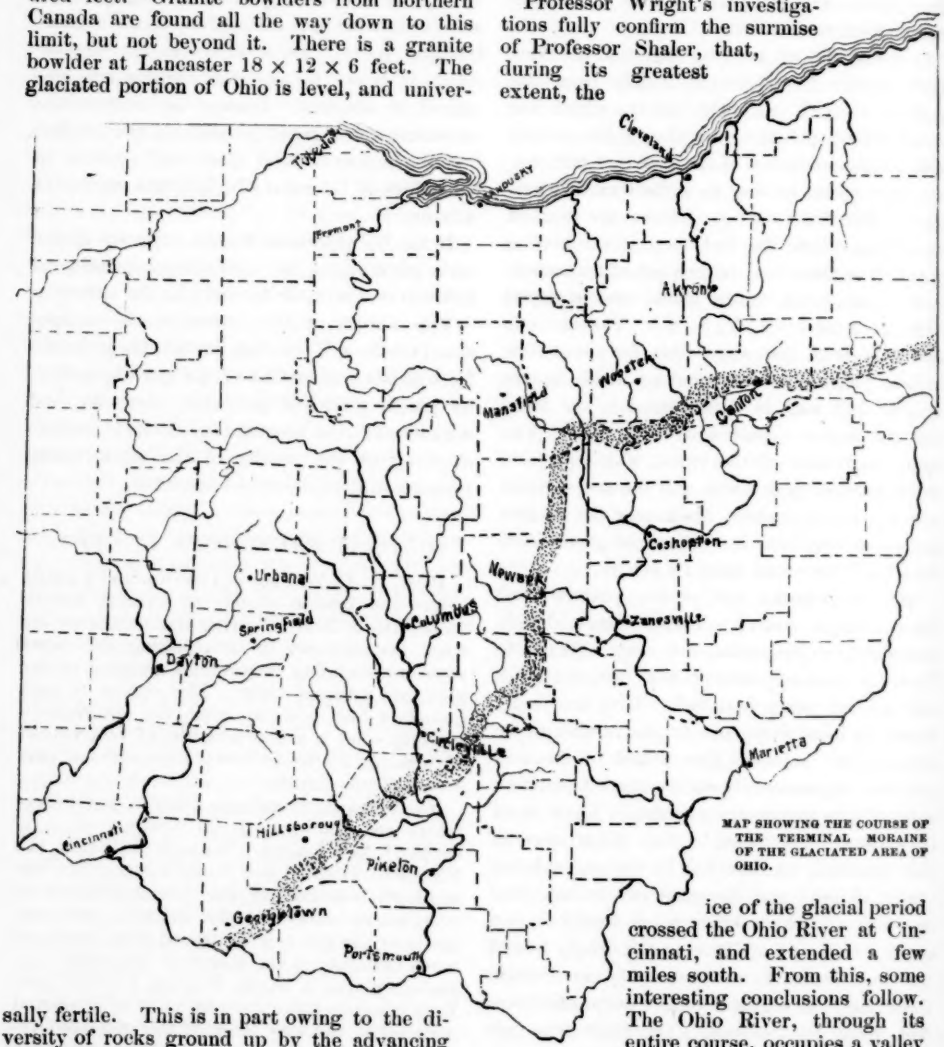
GLACIAL PHENOMENA IN OHIO.

Prof. G. F. Wright of Oberlin read a paper before the Boston society of natural history on the 7th of March, giving the results of his work last summer in determining the exact southern boundary or terminal moraine of the glaciated area of Ohio. The course of this boundary-line is shown upon the accompanying map, and is a continuation of that traced by him and Professor Lewis the previous year across Pennsylvania.

The terminal moraine in Ohio is not everywhere so prominent in its features as it is south of New England, through Cape Cod, the Elizabeth Islands, and Long Island; but the southern boundary of the glaciated region is everywhere very sharply defined, and the limits of the ice can be traced with nearly as much certainty as the shores of the ocean. At various places in Stark, Holmes, Fairfield, and Ross counties there are vast piles of glaciated material at the very limit of the glaciated region. All that portion of Ohio north and west of the line above described is covered with the material which was ground up underneath, and transported by the moving ice. This consists of unstratified fine clay, containing scratched stones and fragments of rock of various kinds from the north. The average depth of this

accumulation (which Dr. Newberry calls 'the grist' of the continental ice-sheet) is about sixty feet; though in places at the very border, as at Adelphi, in Ross county, it is two hundred feet. Granite bowlders from northern Canada are found all the way down to this limit, but not beyond it. There is a granite bowlder at Lancaster 18 × 12 × 6 feet. The glaciated portion of Ohio is level, and universally fertile. This is in part owing to the diversity of rocks ground up by the advancing ice, and in part to the fact that it was pulverized by mechanical action, and is spread evenly over the surface. South of the line the country is cut up into gorges; and, as a rule, the soil is shallow and comparatively sterile. Scratched stones are entirely absent, and granite is found only in the river-valleys. The crop-reports show that the average production of wheat per acre is nearly twice as large in the glaciated as in the unglaciated portion of the state.

Professor Wright's investigations fully confirm the surmise of Professor Shaler, that, during its greatest extent, the ice of the glacial period crossed the Ohio River at Cincinnati, and extended a few miles south. From this, some interesting conclusions follow. The Ohio River, through its entire course, occupies a valley of erosion, having, for more than a thousand miles, cut a gorge from three hundred to five hundred feet deep through the horizontal strata of the coal-formation. During the extension of the glacier into Kentucky, this cañon of the Ohio must have been filled with ice at Cincinnati, forming a barrier in the



MAP SHOWING THE COURSE OF THE TERMINAL MORAINE OF THE GLACIATED AREA OF OHIO.

river nearly six hundred feet in height. This would form slackwater in the Ohio all the way up to Pittsburg, submerging the site of that city to the depth of two hundred and fifty or three hundred feet, and setting the water back far into the valleys of the Alleghany and Monongahela Rivers.

In the extensive gravel-deposits of Ohio, south of the glacial line, no paleolithic implements have as yet been found; but they may be confidently looked for. When they are found, the investigations of Professor Wright and his associates will have important bearings in determining their age; for, in many respects, Ohio affords unrivalled opportunities for determining the amount of erosion which has taken place since the ice of the glacial period withdrew. So far, the evidence points to a later date for the glacial period than that which is advocated by some. The erosion which has taken place since the glacial period is surprisingly small. The streams running over the glaciated surface occupy very shallow valleys. In those rivers whose course was changed by glacial action so as to produce waterfalls the gorges are never more than a few miles long. The period cannot have been extremely long, or these streams would have done more work.

THE WEATHER IN FEBRUARY, 1883.

DESTRUCTIVE floods on the Ohio and tributary waters occurred from Cincinnati and Louisville southward. The water rose higher than ever previously recorded, and property was destroyed estimated as worth $30,000,000. Warnings were issued by the signal-office ten to fifteen days in advance; and merchants had ample time, in most instances, to save their property. The following table exhibits some of the principal facts: —

STATION.	Date water reached the danger-line.	Highest water above danger.		Date water left the danger-line.	Estimated loss.
		Am't.	Date.		
		Feet.			
Pittsburg, Penn.	5	4.8	5	9	$50,000
Marietta, O.	–	–	13	–	50,000
Maysville, Ky.	–	–	12	–	–
Cincinnati, O.	8	16.3	15	22	1,500,000
Lawrenceburg, Ind.	–	–	14	–	–
Vevay, Ind.	–	–	15	–	–
Jeffersonville, Ind.	–	–	16	–	100,000
Louisville, Ky.	8	20.4	16	25	367,000
New Albany, Ind.	9	–	–	–	1,000,000
Shawneetown, Ill.	–	–	–	–	250,000
Cairo, Ill	13	12.2	26	Above at end of month.	–
Memphis, Tenn.	21	Still	rising	28	–
Vicksburg, Miss.	24	"	"	28	–

The last column contains losses only so far as reported. The injuries due to sweeping away of homes, to imperilled health and comfort, and to business delayed, cannot be estimated, but are known to have been very extensive. A very full report is given in the Monthly weather-review of the signal-service.

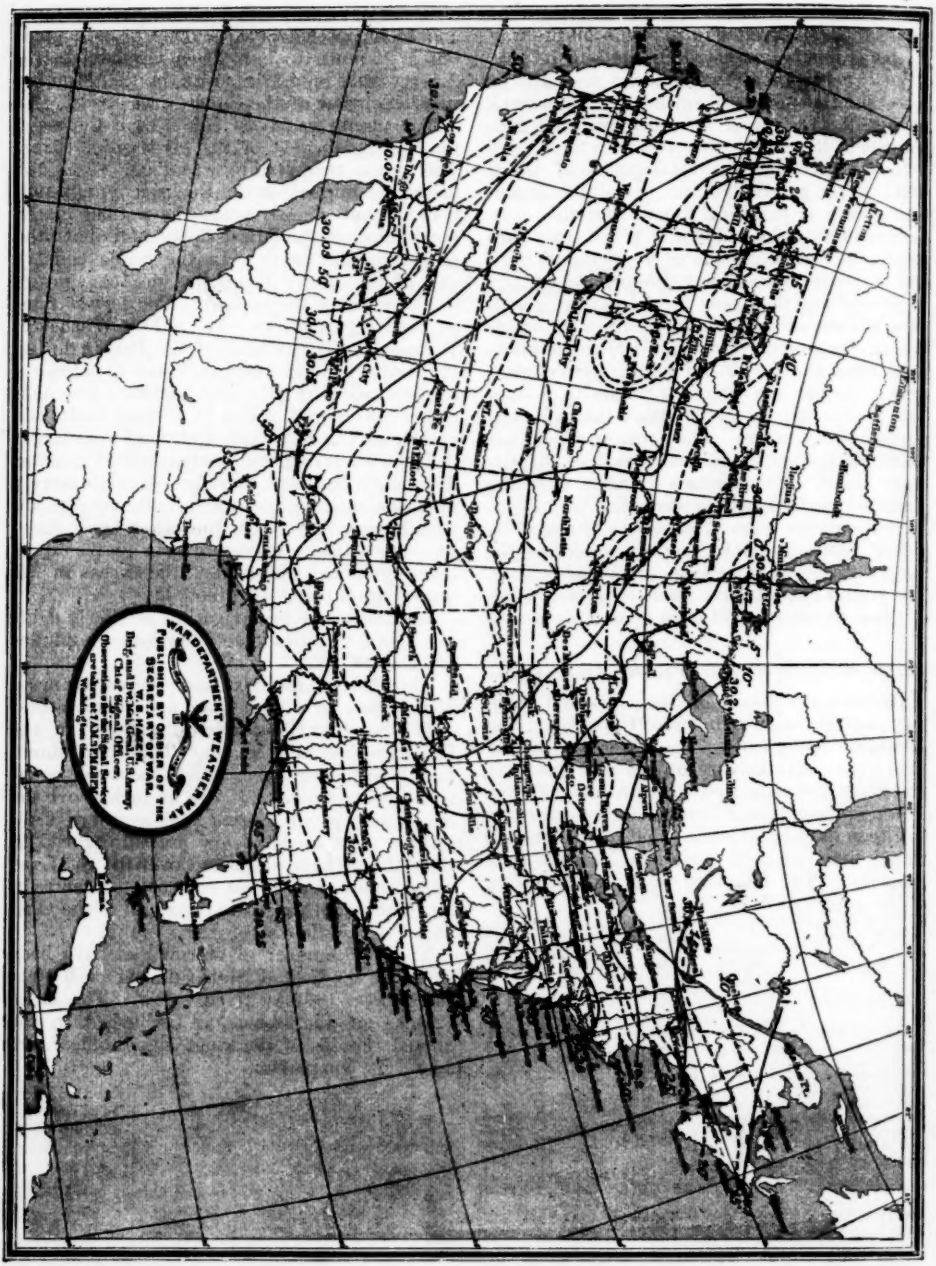
The month has been colder than the mean for the region west of the Mississippi River. The mean temperature was from 8° to 16° below the normal on the Rocky-mountain plateau; it was slightly below the normal in the north, east of the Mississippi; and above the normal in the south. In the whole country east of the Rocky Mountains the temperature was 0.5° below the normal. The lowest temperature reported was −57°, at Fort Washakie, Wyoming. The rainfall of the Pacific during the winter has not been sufficient to assure a medium wheat-crop in that region. The deficiency was over 4 inches in central California and Oregon in February, and there were larger deficiencies during the previous winter months. This important crop, therefore, depends largely upon the spring rains, which in this region are usually very light. On the other hand, there has been a large excess of rain in the lower lake-region and Ohio valley, the excess in the latter region being 3.86 inches.

Ice dangerous to navigation is slowly drifting south to latitude 43°, between longitudes 45° and 48° W.

The chart on the next page shows the mean distribution of air-pressure and temperature, with the prevailing wind-directions in the United States and Canada. This chart shows very high pressure over nearly the whole country, it being from .1 to .2 of an inch above the mean, except in Florida and southern California. The areas of low pressure traced to the Atlantic have all passed over the St. Lawrence valley, and in no case has the centre of any depression passed to the south of the Ohio valley or middle states.

The total number of storms that have been traced in the United States during each February since 1877 is given below. The mean velocity of the storms, as published in the annual reports of the chief signal-officer, are added for comparison.

Year.	No. of storms.	Mean velocity, miles per hour.
1877	11	26.5
1878	8	27.8
1879	6	33.3
1880	14	39.6
1881	9	43.8
1882	11	42.5
1883	10	36.4
Mean	9.9	35.7



MONTHLY MEAN ISOBARS, ISOTHERMS, AND WIND-DIRECTIONS, FEBRUARY, 1883. REPRINTED IN REDUCED FORM BY PERMISSION OF THE CHIEF SIGNAL-OFFICER.

Ten storm-tracks were traced across the ocean. Of these, a very severe one was felt in the north Atlantic from Feb. 4th to 7th. The winds were of unusual severity, and pressures as low as 28.1 inches were reported by several steamers. This storm, however, was exceeded in extent and severity by most violent gales from the 12th to the 16th, when pressures below 28 inches were recorded.

The total movement of the air on Mount Washington (as indicated by a specially devised Robinson's anemometer) was 32,404 miles, there being 1,825 miles on the 17th. Winds over 100 miles per hour were reported on the 1st, 17th, 26th, and 27th.

Ninety-two cautionary signals were displayed during the month; of which 75, or 81.5%, were justified by winds of at least 25 miles per hour within 100 miles of the station.

The most extensive auroral display was that of the 24th, which was observed on the New-England coast, and from the upper Mississippi to Washington Territory. Auroras are also reported on the 1st, 4th, 5th, 13th, 25th, 27th, and 28th. Prof. D. P. Todd of Amherst reports sunspots most numerous on the 12th and 13th, and least on the 23d and 24th. Unusual earthquake-shocks were experienced on the 4th in Illinois, Michigan, New Hampshire, and Maine. It would seem, that, at the same time, shocks were felt in Agram (Hungary) and Madrid (Spain), as cabled to the New-York Herald. On the 27th another notable shock was felt in Connecticut, Rhode Island, and Massachusetts.

THE LAW OF NUCLEAR DISPLACEMENT, AND ITS SIGNIFICANCE IN EMBRYOLOGY.

DURING his investigations upon the development of fishes, mollusks, and arthropods, the writer's attention has been drawn to the physiological relations of the food-yelk, and the germinal matter of the ova of these forms. A more thorough study of the relations of the two principal materials of the ova of various forms has led him to the conclusion that there is a general law which largely, if not entirely, determines the mode of cleavage apparent in various embryological types. Approximations towards a general statement of the law have been made by Von Baer, Haeckel, Balfour, Whitman, and Mark. My only object is to present what I believe to be some new evidence, and to extend the scope of what appears to be an important generalization.

There are only two clearly marked types of ova. These are, first, the holoblastic or evenly segmenting, and, secondly, the meroblastic or unevenly segmenting. The so-called centrolecithal type is found almost altogether amongst the arthropods, and seems to be in a great measure characteristic of them; but, upon close examination and comparison, I believe it will be found that this mode of segmentation is not so widely different from that met with in the ordinary meroblastic ovum. Whatever may be the opinion with regard to the claims for the recognition of two or three types of segmentation, there can be but two forms of ova discriminated in the animal kingdom; viz., those with, and those without, a food-yelk. Those without food-yelk may be called *homoplastic;* that is, they are composed of but one kind of plasma, all of which is germinal. The first segmentation-nucleus is central in position after fertilization, so that the first cleavage divides the ovum into two equal segmentation-spheres. The result of further segmentation is to divide the total germinal mass into tolerably even-sized spheres. The other type, opposed to the foregoing, may be called the *heteroplastic,* by which it is intended to signify that two or more proteids may enter into the composition of the egg, besides oils in the form of drops. At the time of maturation and impregnation the nucleus is displaced from its original central position to a remarkable extent; in fact, it may be so displaced, as compared with its position in very young eggs, as to appear as if it were altogether superficial or parietal; as in the large ova of fishes, reptiles, and birds. This parietal position of the first segmentation-nucleus is not its original one, as an investigation of the developing ovules in the ovaries of these forms will show; but, even long before the first segmentation-nucleus is formed by the fusion of the male and female pronuclei, we actually find, that in some cases the germinative vesicle has migrated from the centre of the ovum, towards the periphery, without having suffered any marked change in size.

To what cause is this permanent displacement of the egg-nucleus due? We find it to occur only in those ova in which we may detect two sorts of plasma, or in those with germinal matter to which a second or passive quantity of matter has been added during the intra-ovarian growth of the egg. The added material may be in the form of a clearly defined yelk, or it may make its presence manifest only after the beginning of segmentation, by aggregating at one pole or centrally as a less homogeneous, more granular mass than the portion directly involved in the process of segmentation. The

germinal matter, protoplasm of the egg, is the self-motile part. The yelk or deutoplasm, on the other hand, is often composed of spherules, granules, plates, or oval bodies, and is converted by metabolic processes into the first during the later stages of development. The first is the potential part of the egg: the latter is the passive and nutritive. Wherever the yelk is greatly in excess of the germinal matter, the embryo is often far developed, as regards morphological details, before the deutoplasm is nearly all absorbed, its final absorption being accomplished largely through the intermediation of the vascular system of the embryo; as in the ova of fishes, birds, and reptiles. The greater the mass of the yelk in proportion to the bulk of the germ, the more extensive is the permanent displacement of the nucleus from its original central position as observed in the young ovicell. The displacement of the nucleus, or germinative vesicle, would then appear to be due to the development of the yelk as a deposit of material of a lower grade of differentiation than the germinal protoplasm in the central part of the egg, as in meroblastic and centrolecithal ova, from the central portion of which the nucleus has been repelled, and taken up into the germinal matter.

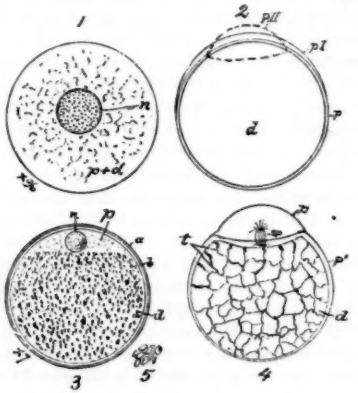
In the eggs of osseous fishes it is certain that the protoplasm, or germinal matter, is arranged on the outside of the yelk, or deutoplasm, in some cases, or sends down processes or a meshwork into the latter, prior to the time of the formation of the germinal disk; so that the teleostean ovum actually passes through a centrolecithal stage. In birds and reptiles, this probably occurs during late intra-ovarian development, as impregnation must occur before encapsulation in the shell, which is formed in the oviduct after the albumen, or 'white,' has been added. Every grade of proportion, from a very small quantity of deutoplasm up to an excessive amount as compared with the germinal protoplasm, may occur; so that no sharp line of demarcation exists between truly holoblastic and truly meroblastic ova. The degree of inequality in the segmentation is therefore, generally speaking, dependent upon the amount of deutoplasm, or food-yelk, which is present, and the degree to which the germinative vesicle has been permanently displaced from its central position. This is, however, qualified by certain secondary modifications, to be discussed at the end of this paper.

This principle accounts for all the forms of unequal segmentation, even including the centrolecithal, where the peripheral segmentation of the germinal matter ultimately displays the working of the same principle of the repulsion of the nuclei from the deutoplasm, and their attraction for the outer protoplasmic segmenting stratum. It, however, explains most beautifully what it is that determines the degree of inequality between the first segmentation-spheres of all truly meroblastic ova. It is therefore of fundamental importance in a scheme of the primary laws of segmentation.

The expulsion of the germinative vesicle from the centre of an evenly segmenting egg, to develop the polar cells, is not to be confounded with the movement of the nucleus towards the periphery of the ovum while still in its follicle, in the large-yelked meroblastic type. The distinction between these two cases, I believe to be fundamental. In the ovum of Ostrea, Unio, Mya, etc., the nucleus at the time of the emission of the egg is still approximately central in position, although the ova are slightly meroblastic; while in Lepidosteus, for example, the nucleus of the nearly mature ovarian ovum is actually peripheral, but has not yet been broken up, or lost its form. Moreover, in the holoblastic type, the nucleus, after its metamorphosis and conversion, in part, into the first segmentation-nucleus, is again repelled towards the centre of the egg, — a phenomenon which does not occur in any meroblastic ovum with a germ-disk of relatively small dimensions, lying upon a disproportionally large yelk. This is a vital distinction, and one which, as far as I am aware, has not been insisted upon in the discussion of nuclear movements. A few illustrative diagrams from the actual subjects will make my meaning much clearer.

Fig. 1 represents an ovicell from the ovary of the common eel, enlarged ninety-six times to show the nucleus (n) in a nearly central position, with a very large number of very small, globular nucleoli adherent to its walls. The surrounding plasma ($p+d$) may be taken to represent both protoplasm and deutoplasm, but in a still undifferentiated state. Fig. 3 is an ovarian ovum of the bony gar (Lepidosteus osseus), very nearly mature, without its granulosa or follicle represented, enlarged seven times. The nucleus (n) in this section has approached the surface of the egg, and is almost or quite in contact with an almost homogeneous outer protoplasmic layer (b) just within the zona radiata (a). Upon examining the material contained within the inner edge of the protoplasmic layer (b), we find that still another differentiation of the egg-substance has occurred by which a portion (p) on either side

of the nucleus (n), and extending around the egg as a thin film, has become quite different from the true deutoplasm (d), which consists of coarse, flattened, ovoidal bodies, as shown in fig. 5 more highly magnified. At the upper pole of the egg, and just below the nucleus (n), the coarser deutoplasm corpuscles or globoids



rapidly become smaller; so that the nucleus is invested by a disk (p) composed of very fine granules, which is in a condition intermediate between that of the external protoplasm layer (b) and the deutoplasm or yelk (d). In very immature ova from the same ovary of Lepidosteus, I find the nucleus in a central position, just as in the ovicell of the eel represented in fig. 1; differing, however, in details of its structure, containing, as it does, a distinct network of trabecular fibres.

The foregoing facts pretty clearly demonstrate the way in which the yelk and germ are differentiated in a meroblastic egg; namely, by a gradual separation of the germinal and deutoplasmic portions of the ovum, the first becoming concentrated peripherally and at one pole by a gradual metamorphosis of the deutoplasm. As this differentiation takes place, it appears that the germinative vesicle is repelled from its original central position, as shown in figs. 1 and 3, and that it never returns to the centre of the deutoplasmic mass, even after the polar cells have been extruded, and the remaining portion has been converted into the nucleus of the first cleavage. In this last regard the meroblastic ovum is in most striking contrast with the holoblastic. Mr. E. L. Mark[1] appreciates this when he remarks, "The nucleus appears ultimately to assume a position of equilibrium, not with respect to the whole mass of the egg, but in respect to its active constituents. Is not, then, this peculiarity ultimately, though indirectly, referable to the want of a uniform distribution of deutoplasm, — to the polar concentration of the protoplasm, in other words?" This covers the ground; but the writer is inclined to believe that the deutoplasm exercises a veritable repulsive force upon the nucleus, as shown in the egg of Lepidosteus, and that in this way only can we explain the failure of the nucleus to return to the centre of the meroblastic ovum after its metamorphosis attending the expulsion of the polar cells, and the fusion of the male and female pronuclei.

The displacement of the nucleus due to its migration during the maturation of the egg has a profound influence upon the mode of development of the various types, as already urged by Haeckel. A study of the mode in which the germ of a fish-ovum is developed may serve to make the nature of this influence clearer. Fig. 2 represents an egg of an osseous fish in diagrammatic outline, without its membrane, in three phases of maturation, up to the time of germ development, which may take place without the influence of the spermatozoon, as shown by the observations of Ransom, Hoffmann, and myself. In the first phase shown by the figure the protoplasm (p) may surround the deutoplasm (d), or it may form a scarcely perceptible layer on the surface of the egg; at a later stage this protoplasm has heaped itself up at one pole of the egg, as shown by the line *pI*; at a still later stage the germinal matter has aggregated itself into a biscuit-shaped germ-mass, the outline of which is shown by the dotted line *p II*. The process is sometimes quite complex, and takes as much as four hours for its completion, as in the cod's egg, in which, as in most fish ova, the disk is formed after the emission of the egg from the ovary. In other types a distinct meshwork of protoplasm, continuous with the external layer, is insinuated between large yelk-masses (d), as shown in fig. 4 at t. This arrangement seems to be the typical one amongst clupeoids. The process of germ-development in true osseous fishes is therefore essentially similar to that which we have described as occurring in Lepidosteus.

According to Hoffmann, the nucleus of the first segmentation is not the one usually hitherto regarded as such, which is concerned in the division of the germ-disk (p) into two equal blastomeres or cells, but its axis in its spindle stage is placed in a line coinciding with

[1] Maturation, fecundation, and segmentation of Limax campestris. — (*Bull. mus. comp. zoöl.*, vi., No. 12, p. 517.)

the axis or diameter of the egg, and not at right angles to it. This is shown in the diagram (fig. 4), in which the first segmentation-nucleus has been metamorphosed into the cleavage spindle (*sp*), with the upper end embedded in the germ-disk (*p*), and the lower end embedded in the protoplasmic layer (*p'*), which consists of the protoplasmic matter not incorporated into the germ, and left over to cover the deutoplasm (*d*). (The thickness of the layer (*p'*) has been exaggerated in the figure for the sake of clearness.) When the spindle (*sp*) has separated equatorially, leaving its upper end in the germ as its nucleus, and its lower end in the protoplasmic layer covering the yelk, as the parent of the free nuclei which afterwards appear in that layer, we may say that the true first segmentation has occurred, which has separated the deutoplasmic or yelk pole of the egg as a single cell from the germ-cell. We see, therefore, that the amount of deutoplasm in excess of the germinal matter actually determines the plane of separation between the germ and the yelk. We can also understand how such an arrangement would cause the mode of development to be modified. The meroblastic and centrolecithal types of ova, on account of the preponderance in bulk of the yelk-mass, are compelled to develop the blastoderm from the disk by spreading, or epibole, or by simultaneous superficial delamination, and cannot be directly transformed into a hollow blastula, as in a holoblastic ovum.

The consequences of the displacement of the nucleus are therefore of great significance in embryology; but the adaptations resulting from the permanent displacement of the nucleus of the ovicell during its development do not end with what has been said in the preceding paragraph. The layer *p'*, of fig. 4, acquires an important physiological function in conjunction with the blood-vascular system, in that it becomes an organ for breaking down and elaborating the yelk into blood-cells in fish ova, as shown by the researches of Vogt, Kupffer, Gensch, Hoffmann, and myself. From the remarkable similarity of the mode of development of the eggs of elasmobranchs, reptiles, and birds, to that of the osseous fishes, — in respect to the mode of germ-formation, spreading of the blastoderm, and the development of free nuclei, in the former and latter types at least, — I should not be surprised if it would be yet determined that such a structure exists in the ova of all of them.

The occurrence of free nuclei, under the blastoderm of the ova of Loligo, Sepia, and Octopus, embedded in the yelk, as found by Lankester; in arthropods by different observers; in those of osseous fishes by Kupffer, Götte, Oellacher, His, Klein, Ziegler, Gensch, Hoffmann, Rauber, and myself; in the ova of sharks by Balfour and Schultz; in those of birds by Götte, Rauber, and Balfour, — is strongly in favor of the doctrine that they have a similar function throughout all of these various forms. Their origin is, doubtless, not spontaneous, as has been believed by some; but, like the nuclei of the blastoderm itself, they have been primarily derived from the first segmentation-nucleus. In Clepsine, according to Whitman, it appears that they enter into the formation of the hypoblast.

Furthermore, it is probable that the development of the germ is actually to be viewed as a process of growth, — concentration of the germinal matter at the animal pole in virtue of its own power of movement. Finally, I would regard the deutoplasm as so much stored material, which — just as the fat globules in a fat cell have pushed the nucleus to the periphery, or as the accumulating fluids in the chorda cells, or as the enlarging sap-cavity in a plant-cell — has displaced the nucleus, and made it assume a parietal position. In evidence of this, I would cite the oval, flattened globoids of the deutoplasm of Lepidosteus (ichthine of Valenciennes and Frémy) as analogous to the stored proteids in many plant-cells. The frequent considerable displacement of the nucleus from the centre of the body in Amoeba, on account of the presence of great numbers of food-vacuoles in the endosarc, seems to be a phenomenon of a similar nature.

The rather anomalous segmentation of the eggs of the frog, lamprey, and Clepsine[1] must be noticed here, as they would appear to form an exception to the principle for which we have contended in truly meroblastic ova; viz., the final dissociation of germinal and deutoplasmic matter at the time of the first cleavage, which divides the whole egg into two nearly equal blastomeres. Immediately or very soon after the first cleavage, the segmentation again becomes unequal, in that smaller blastomeres are formed at the pole where the polar cells have been, or may be supposed to have been, extruded. In this way, it results that a certain mass of cells at the germinal pole of the ovum divide much more rapidly than those containing more deutoplasm at the opposite pole. Now, it is singular that in these types we actually have an approximation towards the develop-

[1] Whitman, Embryology of Clepsine. — (*Quart. journ. micr. sc.*, July, 1878.)

ment of a blastoderm in the more rapid division of the germinal cells at the animal pole of the egg; so that the coarser yelk-cells become included by the blastoderm, by epibole, just as in the typical meroblastic ovum. The segregation of the protoplasmic and deutoplasmic matter, therefore, occurs after the first cleavage in these types; in fact, manifests itself after the first and second cleavages in Clepsine and Rana. It is important to note, however, that in the vicinity where the polar cells have been extruded, the embryonic or germinal differentiation first begins to show itself, and that this is not improbably due to the lingering influence of the original polar displacement of the egg-nucleus at the time of maturation and impregnation. While the germinal vesicle, or rather what represents it, actually returns to the centre of the deutoplasm-laden ovum in these forms, may it not be that a path of germinal matter has remained over in the track of its original outward passage, through which it could return to undergo the first cleavage, shortly after which its segments were again repelled towards the germinal pole?

The mode of evolution of the yelk is of great interest, and doubtless occurred through the working of natural selection. It is evidently adaptive in character; and the necessity for its presence as an appendage of the egg grew out of the exigencies of the struggle for existence. The lower, hollow vegetative cell of a meroblastic egg, such as shown in fig. 4, is, to all intents and purposes, comparable to a fat cell, or to an endosperm cell of a seed containing stored reserve material, which may be, for the most part, in an absolutely non-contractile or static condition, like the oval globoids of the egg of Lepidosteus.

JOHN A. RYDER.

BALTIMORE SURFACE-GEOLOGY.

THE 'Geology of the surface-features of the Baltimore area,'[1] by P. R. Uhler, bears evident marks of the author's unfamiliarity with his subject. No proof is offered in support of a number of assertions concerning the age and the physical changes of the Baltimore strata. After mentioning several rocks, which are referred, apparently without any evidence, to the Laurentian and archaean epochs respectively, we are told, that, "during the *Jurassic* period, these archaean upfolds seem to have attained their maximum development." Not a particle of evidence is offered in support of this assertion, which, we think, would need very strong proof indeed; and we are surprised at the facility with which the author handles 'wide-spreading, while comparatively local changes,' for metamorphic purposes. We also fail to see how the abundance of hornblendic and pyroxene rocks is a "restricted element in the structure of the Baltimore rocks, which serves to give them character, and to separate them broadly from members of the series found in other parts of eastern North America." We were not before aware that a prevalence of such rocks was confined to the vicinity of Baltimore.

Leaving the azoic rocks, the author reaches what he calls the Jurassic period, and says that only the upper member of this great age of reptiles, the 'Wealden,' remains within the Baltimore area. The English Wealden is considered by European geologists as the equivalent of the marine Neocomian of the continent, the lowest member of the cretaceous. Moreover, the Wealden is a fresh and brackish water formation, considered to be the local deposit at the mouth of a large river; and, as shown by Mr. Judd,[1] the actual marine representative of the continental Neocomian occurs at the south end of Filey Bay, in Yorkshire. Sir A. C. Ramsay, although describing the Purbeck and Wealden as a special local fresh-water formation, does not hesitate to consider the Wealden as the equivalent of the Neocomian. The preceding facts will show that it is difficult to see why Mr. Uhler uses the term 'Wealden' in connection with the Jurassic period, or why, if the Baltimore strata are the equivalents of the local fresh-water cretaceous deposit of England, he speaks of them as of Jurassic age.

Mr. Uhler, also says that in the upper Jurassic the flora has made a step in advance, gymnosperms taking the place of the old calamites and their relatives. But this step in advance was made already in the triassic keuper, where cycadites and gymnosperms make their appearance. The Wealden flora belongs to that degree of development of the vegetable kingdom which begins with the Rhetic, and ends with the lower cretaceous. This flora does not completely change till we reach the lower Quadersandstein, or upper greensand, where dicotyledons make their appearance; so that, judging on the evidence of flora alone, we should have to place the Gault or lower greensand also in the Jurassic.[2]

At the close of this Wealden (?) period, Mr. Uhler makes the climate colder, and brings great masses of ice to tear things to pieces, but gives no evidence in support even of this assertion.

[1] Johns Hopkins univ. circ., February, 1883.

RAINFALL OF UBERABA, PROVINCE OF MINAS GERAES, BRAZIL.

THE following observations on the rainfall of the city of Uberaba, by Friar Germano, are interesting as being, so far as known, the first that have ever been made in the great interior Paraná basin; those hitherto published being either for the coast-towns and the maritime range of mountains, or, if actually within the interior basins, too near the margin to represent accurately the rainfall of the interior.

Uberaba is situated about 300 miles from the coast, in latitude 19° 44′ 30″ S., on the elevated grassy plains between the Paraná and its great tributary the Rio Grande. Its position as regards the maritime range and the Paraná-Paraguay basin — the South-American homologue of the Mississippi valley — may be compared with that of Cincinnati, or, better, some of the Ohio towns on or near the divide between the Great Lakes and the Ohio River. It is at an elevation of 750 metres above the level of the sea, according to the determination of Friar Germano.

The material is not at hand for an accurate comparison of its rainfall with that of other points where observations have been recorded. It is, however, not

[1] Quart. journ. geol. soc. Lond., xxiv. 218.
[2] Heer, Monde primitif de la Suisse, pp. 59, 269.

very different from that of Rio de Janeiro (one of the nearest coast-towns where observations have been made) and that of Sabará (some 250 miles to the eastward, near the western margin of the mountainous area of eastern Brazil), and is somewhat greater than that of São Paulo (situated 35 miles from the sea, behind the first ridge of the maritime range).

	1880.		1881		1882.	
	Millim.	Inches.	Millim.	Inches.	Millim.	Inches.
January .	360	14.2	285	11.2	280	11
February .	333	13.1	226	8.9	405	15.9
March . .	109	4.3	138	5.4	180	7.1
April . .	181	7.1	27	1.1	120	4.7
May . . .	19	0.7	15	0.6	60	2.4
June. . .	2	0.1	3	0.1	70	2.8
July . . .	11	0.4	4	0.2	26	1
August . .	2	0.1	6	0.2	80	3.1
September,	70	2.8	12	0.5	97	3.8
October .	190	7.5	102	4	120	4.7
November.	274	10.8	142	5.6	100	3.9
December .	219	8.6	290	11.4	125	4.9
Total . .	1m.770	69.7	1m.230	49.2	1m.663	65.2

Note. — In reducing to inches, hundredths have been disregarded.

Orville A. Derby.

LETTERS TO THE EDITOR.

[*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*]

Pairing of the first-born.

In Science of March 16, p. 167, Charles S. Minot estimates the chance of the first-born male pairing with the first-born female, where there are ten birds of each sex to pair, as one to one hundred. It is easy to see that the first-born male must pair with one of the ten females: he is, therefore, as likely to pair with the first-born female as with any other one; and hence the chance that the first-born male will pair with the first-born female is as one to ten, instead of as one to one hundred. J. E. Hendricks.

Des Moines, March 27, 1883.

Thermal belts of North Carolina.

The abstract of Prof. J. W. Chickering's paper on the above topic (Science, p. 147) has suggested to me the propriety of putting on record the results of observations made by me many years ago, on the 'frostless zones' of the flanks of the mountain spurs adjacent to the valleys in the Blue Ridge. My observations were made at Flat Rock, near Hendersonville, Henderson County, N.C., — a well-watered, fertile, mountain-plateau-like valley, which is about 2,200 feet above the sea-level.

My own observations, and the information elicited from residents, seem to indicate the following facts, which, if verified in other places, may have a bearing on the physical causes which give origin to the 'frostless zones'; viz., the zones in question are *not* exempt from frost during the whole of the cold season: in fact, during the winter, the ground in these belts is frequently frozen to a considerable depth; but during the spring months they are conspicuously and uniformly frostless. They *coincide* with the nocturnal and morning 'fog-belts' of the spring months. The uniform presence of these white, circumscribed belts of fog on the flanks of the mountain spurs, during the early morning hours, imparts a striking feature to the scenery of these valleys. When illuminated by the bright morning sun, they appear like girdles of cotton-wool of moderate width, encircling the peaks at the height of 200 or 300 feet above the adjacent valleys; and their cumulus-like whiteness, contrasted with the verdure above and below them, is no less striking than it is beautiful.

The latter circumstance seems to furnish an explanation of the physical cause of the so-called 'thermal belt;' for the constant fogs at night and in the morning not only prevent refrigeration by obstructing terrestrial radiation, but, during the condensation of vapor in the process of fog-formation, there must be developed an enormous amount of heat just at this zone. Why this condensation of aqueous vapor should be so persistently restricted to a belt of only a few hundred feet in vertical thickness, is a question much more difficult to answer.

The observations of intelligent residents of the mountain valleys, in the southern divisions of the Appalachian chain will doubtless verify or disprove the general *coincidence* of the 'frostless zone' with the 'fog-belt;' and this is the point which some of the readers of Science may be able to settle.

John LeConte.

Berkeley, Cal., March 27, 1883.

Flight of the flying-fish.

A note in Science of March 23, concerning the flight of the flying-fish, leads me to offer the results of my own observations. During a passage through the Indian Ocean in 1880, I had so numerous and excellent opportunities for observing the movements of flying-fish in all kinds of weather, that I determined to discover, if possible, whether or not the wings were of material aid in flight, beyond a mere buoyant action. In many cases the fish would continue its flight for a surprisingly long period, sometimes in the face of the wind. Again, the direction of flight would be changed in such a way as to render it improbable that the wind was the cause. When an object is passing over a rapidly changing surface, it is very easy to imagine it to rise or fall in unison with the latter; but so frequently did I notice a fish clear advancing waves, that I finally was forced to believe them to have the power of controlling their flight. I frequently called upon other passengers to confirm my own observations, with which their testimony was in general harmony. I may say, therefore, that I finally reached the same conclusions as those presented by Mr. Kneeland. D. P. Penhallow.

Mountainville, N.Y., March 29, 1883.

THE NATURAL HISTORY OF OHIO.

Report of the geological survey of Ohio. Vol. iv. Zoölogy and botany. Part i. Zoölogy. Published by authority of the legislature of Ohio. Columbus, *State*, 1882. 8 + 1020 p. 8°.

This long-looked-for volume has appeared, and, notwithstanding its size, includes only the vertebrates of the state. Dr. Newberry, the head of the survey, holds out some hope of a future volume on the invertebrates and on the botany of the state; but the difficulty experienced in securing further appropriations for the publication of the fossil remains leaves their appearance rather doubtful.

The part devoted to the mammals (a hun-

dred and eighty-five pages), by A. W. Brayton, is largely a compilation, as the author states in his preface; but it contains a considerable number of notes upon the habits of various species, the dates of extinction, etc., which are original and valuable. Keys are given for the families and genera discussed, except in the case of the Muridae and a few other groups. Forty-nine species are enumerated, which are distributed as follows: Carnivora, 15; Ungulata, 3; Cheiroptera, 5; Insectivora, 5; Rodentia, 20; Marsupialia, 1. Of these, the following species are, or are supposed to be, now extinct in Ohio: the puma (Felis concolor), the lynx (Lynx canadensis), the pine marten (Mustela americana), the wolverine (Gulo luscus), the badger (Taxidea americana), the wapiti (Cervus canadensis), the beaver (Castor fiber), and the bison (Bison americana).

The paper may, perhaps, be criticised as not containing sufficient information regarding the distribution of species within the state, nor upon such topics as food, local variation, and similar topics, showing a lack of direct observation upon Ohio specimens.

Dr. Wheaton's welcome report on the birds covers four hundred and forty-two pages. Its introductory chapter treats of the physical geography of Ohio, and some peculiarities of its climate; of latitudinal variation in birds; of the general characteristics and affinities of the class Aves; and of the arrangement and definition of the orders of North-American birds. Most of this matter is compiled from high authorities on the several subjects.

In the main body of the work, also, the technical matter is chiefly taken at second-hand. The keys to the genera are from Dr. Jordan's Manual of the vertebrates of the northern United States; the definitions of the higher groups and the descriptions of species, 'almost without exception or alteration,' from Dr. Coues' Key to North American birds; and the nomenclature from Dr. Coues' Check-list of 1874, 'with such modifications as changes made since its publication require.' The name of each species is followed by 'references to all writers, whether general or local, who have mentioned that species as Ohioan;' and, in addition, the general synonymy of the species is given with sufficient fulness to 'enable changes in the nomenclature to be traced.' There is an appendix, also, which includes a Check-list of Ohio birds, with the dates of their appearance and disappearance, as observed in the vicinity of Columbus; a list of the birds which have been seen in the author's garden, in the heart of that city; a bibliography of Ohio ornithology; an essay on the relation between latitude and the pattern of coloration in Ohio birds; and a glossary of such scientific terms as require definition.

These technical matters have evidently been treated with care, and, in the main, wisely; but it is to the biographical portion of the work that we can accord the highest praise. The biographies are usually from Dr. Wheaton's own pen; and in all such cases they are done in a masterly manner. The author brings to his task an intense inherent love of his subject, a philosophical turn of thought well known to all who are familiar with his writings, and a mind trained to the most conscientious regard for scientific truth and accuracy. In addition, his writings have a literary finish by no means common in these days of hasty production; while the quaintness of occasional expressions, characteristic of a generation fast passing away, adds still further to their charm.

In short, while it would be possible to say ungracious things about this report, we may fairly characterize it, on the whole, as a work of high scientific accuracy, general as well as local utility, and universal interest. It is a pity that the ornithology of every one of the United States cannot be treated in an equally exhaustive and able manner.

The report on the reptiles and amphibians, by Dr. W. H. Smith, already favorably known to herpetologists as the author of a systematic review of the Urodela and Coecilia, occupies more than one hundred pages. Thirty-seven reptiles and twenty-three batrachians are described as native in Ohio, and numerous extra-limital forms are discussed. In general, the report seems worthy of high praise. The technical descriptions are pertinent, and the accounts given of the habits and peculiarities of the different species are full and interesting. Of many of the species mentioned, there is no better account extant. In view of the confused and unsifted condition of the synonymy of American reptiles, the value of the quotations would have been increased by the citation of works as well as authors. We notice a few unexplained, though perhaps justifiable, deviations from current classification; as, for example, the reference of Kennicott's 'Regina Kirtlandi' to Regina rather than to Tropidoclonium. There are also a few unnecessary violations of the law of priority in the nomenclature adopted; as in the retention of the name 'Menobranchus,' instead of the prior and now equally familiar 'Necturus.'

The elaborate report on the fishes, by Professor David S. Jordan, occupying more than two hundred and fifty pages, gives an interesting history of Ohioan ichthyology, with descriptions of all the species as well as of the principal genera and higher groups. It appears that the fauna has been increased from the sixty-six species known to Dr. Kirtland (1840–1846) to a hundred and sixty-five. A useful tabulated synopsis exhibits in four parallel columns the names admitted by Rafinesque, Kirtland, and Günther, as well as Jordan. The fauna is also disintegrated into its several elements, — the Lake fauna (26 sp.), the Ohio-river fauna (37 sp.), and the 'species of general distribution' (28 sp.) 'As an illustration of the character of the local fauna of the smaller streams of the interior,' a list of the species (68) occurring in the White River, near Indianapolis, is added, with notes as to their comparative abundance or rarity.

The typography, although good for a public document, could not be accorded much excellence were the work issued by a private publisher; and the press-work is very unsatisfactory. The synonymy of species is printed in much too large type in the division on the mammals, although afterwards changed. This inequality is unsightly; and numerous typographical errors occur.

GEIKIE'S GEOLOGICAL SKETCHES.

Geological sketches at home and abroad. By Archibald Geikie, LL.D., F.R.S., director of the Geological survey of the United Kingdom. New York, *Macmillan & Co.*, 1882. 370 p. 8°.

In this pleasant volume, well illustrated by the author's pencil, Prof. A. Geikie has gathered together a number of sketches, essays, and addresses, picturesque, descriptive, and historical, published during the past twenty years in various journals, and all written with some reference to the science of geology, of which he has been so successful a cultivator. Some of these papers have little more than a local and popular interest, but are gracefully written, and well suited to give the unscientific reader a taste for geological studies. Others have a higher significance, and raise questions which are of importance to all students of geology, and would require for their adequate discussion more space than we can here command.

One of the most interesting of these papers is that entitled 'A fragment of primeval Europe,' in which we are introduced to the crystalline rocks of north-western Scotland and the adjacent isles. These ancient gneissic and granitoid strata, first critically studied by MacCulloch, were early recognized as the lithological and mineralogical analogues of the primitive gneisses of Scandinavia and parts of North America; and in 1855, after the name of Laurentian had been given to the latter, it was suggested that the name should be extended to the similar rocks of Scotland, which Murchison had called the fundamental gneiss, — a suggestion since adopted. The aspect of the region occupied by these ancient rocks is peculiar. "The whole landscape is one of smoothed and rounded bosses and ridges of bare rock, which, uniting and then separating, enclose innumerable little tarns. There are no definite lines of hill and valley: the country consists, in fact, of a seemingly inextricable labyrinth of hills and valleys, which, on the whole, do not rise much above, nor sink much below, a general average level." No peaks nor crags are seen; and "the domes and ridges present everywhere a rounded, flowing outline." The whole area is, according to our author, smoothed, polished, and striated, as if ice-worn, and presents, in fact, a typical glaciated surface. Over this 'tumbled sea of gray gneiss' rise conical mountains of nearly horizontal, dark-red sandstone, capped by white quartzites, the summits sometimes attaining 3,400 feet above tide-water. Two good woodcuts serve to illustrate the peculiarities of this curious landscape.

These uncrystalline, unconformable beds of Cambrian age, dipping gently eastward, are succeeded by fossiliferous limestones belonging to the same period, which, in the same direction, appear to pass below a series of flaggy gneisses and crystalline schists, the age of which has been a burning question among British geologists. The problem regarding them is identical with that which has been raised in New-England geology; namely, whether the crystalline schists, towards and beneath which the fossiliferous paleozoic rocks lying to the westward are seen to dip, are newer or older than these. Professor Geikie, for Scotland, holds to the former view, and supposes these crystalline rocks in the Highlands to be formed from a subsequent alteration of still younger paleozoic strata: but in Scotland, as in New England, the opposite view is now, by most geologists, held to be established; namely, that the crystalline rocks in question are pre-Cambrian, and in that sense a part of the 'primeval' world.[1]

Geikie shows that the sculpturing of the

[1] Geological magazine, February, 1883, p. 83.

surface of the Laurentian gneiss of western Scotland was anterior to the deposition of the Cambrian sandstones, and that there are minor domes and bosses of crystalline rock, continuous with those of the exposed surfaces supposed to bear the marks of modern glacial action. The conclusion from this would seem to be, that the latter agency has done little more than groove and polish these ancient rounded surfaces, from which a later erosion had removed the covering sandstone. Whether the pre-Cambrian erosion was glacial is a question which Geikie does no more than suggest. In this connection, the existence of a state of chemical decay as a necessary preliminary to the erosion of crystalline rocks should not be lost sight of.[1] We believe that such a process predetermined the contours of their present eroded surfaces.

The question of the erosion of ancient land-surfaces is further discussed by Geikie in a lecture here republished, given by him before the Royal geographical society in 1879, on The geographical evolution of Europe. In this, by aid of the data of geology, he gives a chapter on what has elsewhere been called paleogeography. Geikie shows that the fragment of primeval Europe already noticed, was a part of a great pre-Cambrian area, to which parts of Finland and Scandinavia belonged, and from which was derived the sediments that built up the Cambrian and Silurian series of Great Britain and western Europe. These lower paleozoic rocks in Great Britain alone, he assumes to cover an extent of 60,000 □ miles, with an average thickness of 16,000 feet, or 3 miles, which figures he considers below the mark, — making not less than 180,000 cubic miles, equal to a mountain range from the North Cape to Marseilles, or 1,800 miles long, 3 miles high, and 33 miles wide. This, he well remarks, represents but a fraction of the material thus derived; since in the seas of that time, extending far eastward, were also laid down great thicknesses of paleozoic rocks, continuous with those of the British isles. Calculations of this kind, applied to North America, give us still larger notions of the erosion of great pre-Cambrian areas belonging to some Palae-Atlantis.

It would be profitable, with Geikie's sketches as our guide, to glance at the glaciers of Norway, the ancient volcanoes of Auvergne and of north-western Europe, and to accompany him, in his excursion in 1880, into our western states, where his quick eye readily comprehended many of those remarkable characteristics which make the transcontinental journey from the Atlantic to the Pacific a geographical education.

In his lecture on assuming his late post of professor of geology at Edinburgh, in 1871, Geikie has happily delineated the characters of the Scottish school of geology, and traced many of the characteristics of its masters — Hutton, Playfair, and Sir James Hall — to the local peculiarities of their native land, with its crystalline, contorted, and unfossiliferous rocks, so unlike the regions in which the early Italian school laid the foundations of geology. It is instructive, in this connection, to reflect how the great and simple outlines of American paleozoic stratigraphy, as displayed in the Appalachian basin, led to the grand conceptions of structural geology formulated by the brothers Rogers, by James Hall, and by Lesley, and how the remarkable features of our western regions have taught our geologists of the younger generation lessons which have enabled them so greatly to advance the science, and to correct the views of their predecessors, both in the old and the new world.

We hope on another occasion to notice more in detail some of the questions raised in this instructive volume, in which every student of geology will find something to instruct him, and to stimulate thought.

[1] Harper's annual record of science, etc., 1873, p. xlix.

VERTEBRATE ANATOMY.

A handbook of vertebrate dissection. Part ii. How to dissect a bird. By Prof. H. NEWELL MARTIN and Dr. WILLIAM A. MOALE. New York, *Macmillan*, 1883. 4 + [86] p., 3 pl. 12°.

THIS second part of the handbook is quite up to the standard of the first. It is comprehensive, without going beyond its intended limits; the descriptions are clear and well-worded; the subjects selected for illustration are those most needing it, viz., the more complex parts of the skeleton; and the diagram constituting figure 5 will prove very useful in clarifying certain ideas of the learner.

The method of treatment is well calculated to bring out the observational power of the student; and the fact that the avian, rather than the generic and specific characters, are made prominent, renders the book much more widely useful, and also serves to commend it to practical workers in zoölogy. With the other books of this series, which are to treat in a similar manner of a rat, a bony and cartilaginous fish, and one of the large, tailed amphibia, or Urodela, we shall be supplied with a book which has long been needed in America.

It will be especially welcomed in those laboratories where considerable attention is already given to vertebrate work; and it will do good service in aiding to bring about a more equitable division of time and opportunities in those laboratories where the invertebrates have hitherto received the lion's share of attention, and in some cases have taken nearly, or quite all, the time in a course supposed to be devoted to general zoölogy.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

MATHEMATICS.

Attractions. — M. Angelitti discusses the case of the attraction exerted between two masses when the attraction varies as the product of the masses and some function of the distance. The particular function of the distance employed is the inverse nth power. The author considers the attraction of lines and plane figures upon a point in the plane, and finally briefly considers the attraction of surfaces and solids upon points external to them. Nearly all of the results are known, many of them having been given by Jellett and Townsend. — (*Giorn. mat.*, xx.) T. C. [584

Bernouilli's numbers. — Mr. Ely, in a paper read before the J. H. U. mathematical society, Jan. 17, 1883, gave an account of the numbers $A_{n,m}$ (generally known as $\Delta^n O^m$) which occur in the proof of Staudt's theorem concerning Bernouilli's numbers. After giving the definition of these numbers in the form of a series, and stating some of their known properties, Mr. Ely proceeds to enunciate a number of new properties. Without using a great many algebraical symbols, it is impossible to give a fuller notice of Mr. Ely's interesting communication. — (*Johns Hopkins univ. circ.*, No. 21, 1883.) T. C. [585

Partitions. — Professor Sylvester defines partitiongraphs, and makes certain applications of their properties to infinite series and infinite products, and particularly to the two forms of representation of the theta functions of one variable by means of an infinite series and an infinite product. A partitiongraph is defined as a series of points lying in lines parallel to two fixed lines. The number of points, or lines parallel to one of the boundaries chosen at will, will represent the successive components of the partition, and the number of the lines themselves will be the number of parts in the partition. The lines in question are termed *magnitude*-lines, and the crossing ones *part*-lines. The graph is termed regular when the magnitude-lines never increase as they recede from the rectilinear boundary to which they are parallel. This cannot happen without the same being true of lines parallel to the part-boundary. A regular graph is thus one in which the lines and columns of points neither of them increase as they recede from their respective boundaries. A partition is self-conjugate when its representative graph, after an interchange of the names of the part- and magnitude-lines, gives the same reading. Such a graph is therefore symmetrical. By application of the properties of the above-described partitiongraphs, Prof. Sylvester proves the equation between the reciprocal of $(1-ax)\,(1-ax^2)\,(1-ax^3)\,\ldots$ and the infinite series

$$1+\frac{x}{1-x}\cdot\frac{a}{1-ax}+\frac{x^4}{(1-x)(1-x^2)}\cdot\frac{a^2}{(1-ax)(1-ax^2)}+\ldots$$

He also shows how to obtain the development in infinite series of the infinite products $(1+ax)\,(1+ax^3)\,(1+ax^5)\,\ldots$ and $(1+a^{-1}x)\,(1+a^{-1}x^3)\,(1+a^{-1}x^5)\,\ldots$ A parallel bipartition of u is defined as a couple of sets of numbers written on opposite sides of a line of demarcation, so that the number of numbers on the left always exceeds that on the right by a given difference, δ, which may be any number from zero upwards, and such that the sum of all the elements collectively is equal to n. Then the co-efficient of $x^n a^j$ or $x^n a^{-j}$ in the above products is the number of parallel bipartitions of n to the difference j, limited to contain only odd numbers, which must not appear in the same arrangement more than once on the same side of the line of demarcation. In vol. v., No. 3, of the *American journal of mathematics*, Prof. Sylvester will give a full account of this new theory of partitiongraphs. — (*Johns Hopk. univ. circ.*, No. 21.) T. C. [586

PHYSICS.

(Photography.)

Speed of drop-shutters. — M. Vidal has suggested a method of measuring short exposures. He employs a large clock-face painted black, with white figures, numbering from 1 to 100, painted upon it. A white index-hand is revolved from behind at a uniform speed of one turn per second. Photographs taken of this apparatus themselves register the time of exposure. — (*Brit. journ. phot.*, March 9.) W. H. P. [587

Photographic defects and their remedies. — A short article by Mr. E. H. Farmer gives a list of all the principal photographic defects, together with their remedies. They include gray or metallic, pink, green, yellow, red, and white or opalescent fogs; also frilling, halos, want of density, and spots on the film. — (*Brit. journ. phot.*, March 9.) W. H. P. [588

Notes. — To make plates tropical. Heat them for two hours in a hot oven.

To clean plates. Soak them in hot water, which will dissolve the gelatine.

A convenient plate-lifter. Solder a long, pointed piece of metal to an ordinary thimble. By this means, the plates can readily be lifted from the trays. — (*Phot. times*, Feb.) W. H. P. [589

Electricity.

Efficiency of an electric motor. — Professor S. P. Thompson shows very simply, by means of a graphical method, the laws of work and efficiency of an electromotor, as dependent upon the ratio of its electromotive force to that of the electric supply. — (*Phil. mag.*, Feb.) E. H. H. [590

The electrostatic and electromagnetic systems. — The French have been taking their turn in discussing this matter. MM. Mercadier and Vaschy seek to reconcile the two systems by means of co-efficients depending on dielectric and magnetic inductive capacities. Their arguments and experiments are criticised by M. Maurice Lévy. One who has followed the discussion of this matter, as it has appeared in the *Philosophical magazine* during the

past year, and has read in particular the article of Dr. O. J. Lodge in the November number, will probably learn but little from the French treatment of the subject. — (*Comptes rendus*, Jan. 8, 22, 29, and Feb. 12.) E. H. H. [591

A new dynamometer. — Dr. H. Hertz calls attention to the fact, that, in a Weber's dynamometer, the ratio of the apparent resistance offered to an alternating current of period (T) to the real resistance (r) of the instrument is $\sqrt{1 + \left(\frac{P^2\pi^2}{T^2r^2}\right)}$, where P is the co-efficient of self-induction. He concludes that the instrument can give no information as to the presence or absence of a current which changes its direction more than ten thousand times in a second; nor can it be applied to such problems as the discharge of a Leyden jar through a short metal conductor. He therefore proposes a new dynamometer, which measures the energy by the heating of a small silver wire through which the current passes. The expansion of the wire is made to rotate a steel needle to which a mirror is attached. It is claimed that a change in temperature of a thirtieth of a degree, cent., can thus be detected. The self-induction of this instrument is, of course, zero; and its resistance need not be large. From experiments on an instrument of resistance .85 S. U., the author concludes that a current of one Daniell's cell through 30 S. U., and, by shunting, currents of any strength, may be determined with sufficient accuracy. — (*Zeitschr. f. instrumentenkunde*, Jan.) J. T. [592

CHEMISTRY.

(Organic.)

Kyanethine and certain of its derivatives. — In continuing the study of kyanethine, E. v. Meyer finds that nitrogen is eliminated by the action of nitrous acid with the formation of an oxy-base, $C_9H_{13}N_2(OH)$ (oxykyanconiine). Methyl iodide forms methylkyanconiine, $C_9H_{13}N_2(NHCH_3)$, in which the methyl group is attached to a nitrogen atom, as shown by the formation of methylamine and the oxy-base, when it is heated with hydrochloric acid. Methyl-, ethyl-, and ethylen-derivatives of the oxy-base were examined. By the action of bromine upon kyanethine, an oily product was obtained, which gave a fat acid (probably propionic), isodipic acid $\begin{pmatrix}CH\ CH_3\ COOH\\ |\\ CH\ CH_3\ COOH\end{pmatrix}$, and a third acid containing nitrogen. When mixed with two volumes of concentrated ammonia, the chief product was an amide of the same butylendicarboxylic acid. The formula

$$C_6H_3 - N = NH \quad \begin{matrix}(CH_3)_2 \\ \diagup\!\!\diagup \\ \diagdown \\ NH_2\end{matrix}$$

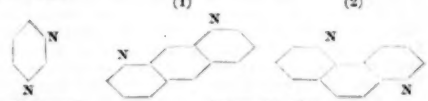
is regarded by the author as the most probable expression of the constitution of kyanethine. Kyanmethine was also prepared by the same method; viz., by the action of sodium upon methyl cyanide. Its derivatives and reactions were analogous to those of kyanethine. — (*Journ. prakt. chem.*, xxvi. 337, and xxvii. 152.) C. F. M. [593

Meconic acid and its derivatives. — That meconic acid is not a tribasic acid, as Liebig and others have asserted, is shown by a study of its ethers. E. Mennel prepared the mono- and diethyl-ethers with alcohol and hydrochloric acid; but the triethyl ether could not be obtained in this way. The third ethyl group was introduced by heating the silver salt of the diethyl ether with ethyl iodide. The absence of other hydroxyl groups was shown by ferri cchloride, which gave no red color when added to an alcoholic solution of the ether. Mennel assigns to this acid the formula $C_5HO_2\begin{matrix}COOH\\COOH\\OH\end{matrix}$. If it has this constitution, the ethyl group attached to the hydroxyl must have different properties from either of the two attached to the carboxyl groups. That this is the case, appears from the formation of ethylmeconic acid when the triethyl ether is heated with water, and from the conversion of ethylmeconic, when heated, into ethylkomenic acid, $C_5HO_2\begin{matrix}COOH\\COOH\\OC_2H_5\end{matrix} = C_5H_2O_2\begin{matrix}COOH\\OC_2H_5\end{matrix}$.

Bromoxylbromkomenic acid $\left(C_5HBrO_2\begin{matrix}COOH\\OBr\end{matrix}\right)$ was prepared by acting upon bromkomenic acid with bromine and water. With reducing-agents, it gave bromkomenic acid, which was converted into oxykomenic when heated with hydrochloric acid in an alcoholic solution. It seems that the hydrogen atom in the radical of meconic acid $(C_5HO_2)'''$ can be substituted only with difficulty, and but one hydrogen atom in the komenic-acid radical $(C_5H_2O_2)'''$ can be replaced. — (*Journ. prakt. chem.*, xxvi. 449.) C. F. M. [594

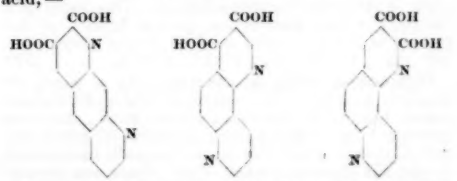
Derivatives of dipyridyl. — By means of the glycerine-chinoline reaction, Skraup and Vortmann obtained from metadiamido- and metadinitro-benzol phenanthroline ($C_{12}H_8N_2$), which contains two pyridine rings, —

(1) (2)



Diamidobenzol. Phenanthroline.

Although but one pyridine ring takes part in reactions with methyl iodide, bromine and acids, an octo-hydride ($C_{12}H_8N_2H_8$) resulted from the action of nascent hydrogen. By oxidation with potassium permanganate, beside chinolinic acid, dipyridyldicarboxylic acid was formed in small quantity. One carboxyl group was removed from this acid by heat alone; and, on heating with calcium hydrate, an oil (dipyridyl) distilled over. According to the authors, this is the first representative in the pyridine series of bodies analogous to diphenyl. If phenanthroline is an analogue of anthracen, (1) there would be but one form for the dicarboxylic acid; but if, as the authors regard more probable, it is similar to phenanthren, (2) there are two possible forms for this acid, —



— (*Sitzungsberichte kais. akad. Wien.*, lxxxvi. 304.) C. F. M. [595

On acetoxime. — A study of the benzyl-derivatives of acetoxime indicates the formula

$$(CH_3)_2 = C = N - OH.$$

This substance was obtained by v. Meyer and A.

Janny from acetone and hydroxylamine. From the formation of benzyl iodide when its benzyl ether was treated with hydriodic acid, the benzyl group must be attached to the rest of the molecule by the oxygen atom. — (*Berichte deutsch. chem. gesellsch.*, xvi. 170.) C. F. M. [596

Acetoximic acids. — C. Schramm obtained representatives of this class of bodies by the action of hydroxylamine chloride on isonitrosoethyl- and isonitrosobenzyl-acetone. In general, the reaction may be expressed by the equation

$$\begin{matrix} \chi - CO \\ | \\ \gamma - CNOH \end{matrix} + H_2NOH - HCl = \begin{matrix} \chi - C = NOH \\ | \\ \gamma - C = NOH \end{matrix} + H_2O + HCl.$$

— (*Berichte deutsch. chem. gesellsch.*, xvi. 180.) C. F. M. [597

METALLURGY.

Mexican copper-smelting. — A native process of working copper ores is described by W. B. Devereux, as now being practised in the state of Jalisco, Mexico, and as producing very pure copper by using two tons of charcoal to one ton of ore. A basin eighteen inches in diameter, and three inches deep in the centre, is made in the earth, and lined with oak-ashes. Upon one side of the basin two tuyeres are placed, which are blown by a hand-bellows. A log is placed with one end across the basin at right angles with the tuyeres, and is supported on a roller, so that it can be fed up as fast as it is consumed. The charcoal and calcined ore are placed on the side of the log opposite to the tuyeres, and are renewed as fast as they are burned and melted away. Three hundred pounds of ore are said to be smelted in four hours. The copper and cinder settle into the basin; and, when the latter is full, the charcoal is scraped away. The slag, as it cools on the surface, is lifted off in cakes until the copper is exposed. This is allowed to cool. The cake of copper is then removed, and the operation begins again. The copper is so pure that it can be rolled without cracking. The whole smelting process is performed without the aid of a single tool that cannot be obtained in the chase, in the woods, or in the clay-bank. The calcining of the ore is done in an English calciner, left on the location by a former company. — (*Trans. Amer. inst. min. eng.; Col. meeting*, 1882.) R. H. R. [598

The patio process in San Dinas, Mex. — As described by Richard E. Chism, the broken silver ore is ground in an arrastre till there is no more grit. It is then brought to the patio, or large, circular, concave, paved floor. Here it is treated at intervals with mercury, salt, and sulphate of copper, and is stirred and worked by the feet of mules. It is then exposed to the sun for some days. Finally, the amalgam formed is washed and retorted. The cheapness of the plant is its great recommendation. This paper is a carefully written description (giving figures) of the process as it is at present used. — (*Trans. Amer. inst. min. eng.; Col. meeting*, 1882.) R. H. R. [599

Charcoal-making in retorts. — In a paper on charcoal as a fuel in metallurgy, John Birkinbine states, that at the Bangor furnace, Mich., there are fourteen kilns of eighty cords capacity, in which sixteen thousand cords of wood are annually carbonized. At the Elk Rapids furnace, Mich., there are twenty-two one-hundred-cord kilns, in which forty thousand cords of wood are each year converted into charcoal. The acetic vapors are exhausted from all these kilns by Peirce's patent method, and converted into acetate of lime and methylic alcohol. The two plants produce daily seventeen thousand pounds of acetate of lime, and two hundred and fifty gallons of alcohol. That the charcoal is not deteriorated by the collection of the acetic vapors, is proven by the reports of the managers of these plants, and by the remarkable records made by both these furnaces. — (*Trans. Amer. inst. min. eng.; Col. meeting*, 1882.) [600

AGRICULTURE.

Artificial and natural digestion of proteine. — Stutzer, having devised a method for the separation of the true proteine of fodders from the non-proteid nitrogenous matters, has applied this method to the study of the action of acidified pepsin solution on the proteine of feeding-stuffs. As the general result of his experiments, he finds that the nitrogenous matters of fodders may be divided into two groups, called by him proteine and nucleine; the former of which is entirely digestible, and the latter entirely indigestible. Stutzer's results on certain feeding-stuffs agreed quite closely with those that have been obtained in actual digestion experiments with animals, and suggested the possibility of thus artificially determining the digestibility of this important class of nutrients in a very simple manner; but no comparative experiments on identical samples were made.

This deficiency has been supplied by Pfeiffer, who has compared the actual digestibility of meadow-hay and lucerne-hay, by sheep, with the results obtained by Stutzer's method. The results of three experiments are given. In each case the actual digestibility was somewhat less than that indicated by Stutzer's method.

Calculated digestibility.	Observed digestibility.
68.4 per cent.	60.4 per cent.
76.1 "	73.0 "
76.1 "	74.5 "

A portion of the nitrogenous matter of the solid excrements, however, consists of billiary products, and other matters not derived directly from the food, and therefore not properly classed with its indigestible matters. When this was taken into account in calculating the actual digestibility, a closer agreement was obtained than is shown by the above figures.

On the other hand, however, the nucleine of the solid excrements, as determined by Stutzer's method, was twenty-five to thirty per cent less than the amount found in the fodder, showing that some of the latter must have been digested. It would seem, then, so far as conclusions can be drawn from three experiments, that Stutzer's proposed method may serve to give an approximation to the digestibility of the proteine of a fodder, and possibly prove a useful addition to the methods of fodder analysis, but that his artificial digestion does not correspond in all respects with natural digestion. — (*Biedermann's centr.-blatt*, 1882, 739.) H. P. A. [601

Digestive fluids of the horse. — Space permits only a summary of the more important results obtained in this valuable investigation by Ellenberger and Hofmeister.

a. The saliva. The mixed saliva contains an energetic diastatic ferment, which acts at once on cooked starch, but more slowly on uncooked. Potato-starch is not saccharified during mastication, but minute quantities of oat or barley starch may be. Both the parotid and the submaxillary saliva have a diastatic action, though it is not so energetic as that of the mixed saliva. The action of the mixed saliva equals 'the product of the actions of its components.' In

the blood of the horse, and also in most other fluids and organs, diastatic ferments are present, but in much less quantity than in the saliva. Slightly acidifying the saliva, or mixing it with small quantities of artificial (acid) gastric juice, does not hinder the diastatic action. Greater concentration of the acid hinders the action, but does not destroy the ferment. The saliva acts slowly upon cane-sugar. The parotid saliva contains traces of a peptonizing ferment. The saliva does not act upon cellulose. It can emulsify the fats, but does not decompose them.

b. The gastric juice, and gastric digestion. The gastric digestion of the horse is of more importance than has been hitherto supposed. It continues from one meal to the next. When oats are fed, the contents of the stomach constitute a comparatively dry, crumbly mass, containing sixty to seventy per cent of water. With hay-feeding, the contents are somewhat moister. The normal reaction of the contents of the stomach is distinctly acid. The proportion of acid seldom rises higher than two-tenths of one per cent. It is least immediately after eating, and increases gradually. The gastric juice of the horse is much less acid than that of the carnivora. At the beginning of digestion, only lactic acid is present. Subsequently, hydrochloric acid appears, and more abundantly with hay-feeding than with oats; but lactic acid is always present. In the contents of the stomach there is always found a diastatic, a lactic, and a rennet ferment, and a ferment which dissolves proteine. Starch is digested to a large extent in the horse's stomach: the action is most rapid during the first one or two hours, though depending somewhat on the quantity and quality of the food. Vegetable proteine is energetically digested, and converted into peptones. The action is slight at first, but augments, reaching its completion in three to eight hours, according to the amount of food present. When large amounts of food are taken into the stomach, much pepsin and acid must be secreted to neutralize the alkaline saliva, and initiate digestion; and, consequently, the time required for digestion is longer. If more food is taken in such a case, that previously eaten is crowded into the intestines in an undigested state. — (*Biedermann's centr.-blatt*, 1882, 805.) H. P. A. [602

GEOLOGY.

Atlantis revived. — Professor Hull has published twenty-seven "Paleo-geological and geographical maps of the British Islands and the adjoining parts of the continent of Europe," showing the distribution of the exposed strata of the different geological periods, and their concealed extension. In portraying the latter he has been largely aided by the numerous borings which have been made during the last twenty-five years. Some of the maps show the known and theoretical distribution of land and water during the different geological periods.

In preparing these maps, Prof. Hull has become forcibly impressed with two leading ideas, — first, that the present North Atlantic Ocean must for a long lapse of time have been a continental area, whence was derived, to a large extent, the sediment of which many of the British formations are composed; and, secondly, that the Old Highland districts of the British Isles, once they had sprung into existence as such, ever after endeavored to retain their ascendency. He considers "that the North Atlantic was mainly land during the Laurentian, Cambrian, and lower Silurian periods, and was the source of the sediment of which these great formations are composed. It probably first assumed large proportions as a sea or ocean, when so much of the *then sea* became land; namely, at the close of the lower Silurian period. But there are grounds for believing that it was largely in the condition of a land-surface in still later times; namely, during the carboniferous, Permian (dyassic), triassic, and Jurassic periods, as evinced by the thickening of the sediment both towards the north-west and south-west of the British Isles. This great continent of *Atlantis* was the parent of much of the strata which now overspreads the plains of Britain and of the adjoining continental areas. With the cretaceous period, its permanently oceanic form and features set in, and were vastly extended during that and the succeeding period of the nummulitic limestone." A description of each plate is given, which is clear and systematic, containing many references to different authorities used. A discussion of each map would require a memoir as large as the original: suffice it to say, that the work has been prepared with care, and reflects great credit on its author. There are many points in the geology of North America which would appear to be strongly in favor of Mr. Hull's views; such as the Jurassic age of the Rocky-mountain uplift, and the absence in the same region of any Silurian strata, the carboniferous limestone reposing on the Taconic or on older rocks, showing that region to have been land during the formation of the vast Silurian sediments of the Mississippi basin; the absence of more recent formations on the north-eastern coast; the fresh-water nature of the Richmond trias, etc. Prof. Hull has done well in attacking the theory of the permanence of ocean-beds, which, in my opinion, is not borne out by the geological facts; and a perusal of his work should encourage others to enter into this very interesting field of research. — (*Trans. roy. Dubl. soc.* (2) i. xix.) J. B. M. [603

Meteorites.

The Cranbourne meteoric iron. — Two large blocks of meteoric iron were found in Victoria, Australia, in 1854; one mass weighing several hundredweight, and the other three or four tons. This last was sent to the British museum, and has recently been studied quite thoroughly from the chemico-mineralogical point of view by Dr. Walter Flight, of that museum.

When this mass was found, only a small portion projected above the soil, while the remaining portion was embedded in tertiary sandstone overlying basalt. Dr. Flight states that the entire mass consists of metallic minerals, and is destitute of silicates. In the course of the analysis, the nickeliferous iron was found to contain numerous minute, brittle, strongly magnetic, apparently square prisms, which form about one per cent of the mass. These prisms are slowly and with difficulty acted upon by H Cl, but are readily dissolved in H N O_3. To this, after analysis, the symbol $(Fe_4Ni_3)P$ was given, and it was regarded as corresponding to Gustav Rose's rhabdite.

Certain scales were observed lying on the faces and between the plates of the nickeliferous iron crystals, that were in the form of equilateral triangles, having the thickness of stout writing-paper, pliant, strongly magnetic, and of a pure white color. It was found to contain 70.138 % iron, and 29.744 % nickel, and was regarded as being the same as Gustav Rose's tänite, and Zimmerman's meteorine. Since the composition was first definitely made out by Dr. Flight, he proposes for it the name *edmondsonite*. It would certainly have been a more gracious thing if he had allowed Rose's name to stand, instead of yielding to the species-making mania, and thereby increasing the confusion in mineralogical nomenclature.

The analysis of a brittle, magnetic powder, which

dissolved easily in HNO_3, and which was regarded as schreibereite, gave the formula $(Fe_2Ni)_7 P$. A large brass-colored, oblique crystal, showing perfect basal cleavage, dissolved readily in *aqua regia*, but was only slowly acted upon by HCl or by HNO_3 alone, and gave, on analysis, the formula $(Fe_9Ni_2) P_2$. Another crystal was found, which was apparently a square prism, having brilliant metallic sides, with a dark, almost black centre. Its analysis gave the formula $(Fe_7Ni_2)_8 P$. Graphite occurs occasionally in this meteorite, both in nodules and in plates. The nickeliferous iron was also examined for occluded gases; and carbonic acid, carbonic oxide, hydrogen, nitrogen, and marsh gases, amounting in bulk to 3.59 times the volume of the iron, was extracted.

It is to be regretted that more attention is not paid by chemists to the question of the average composition of meteoric masses as a whole, instead of giving their time exclusively to the analysis of the distinct minerals the mass may happen to contain. — (*Geol. mag.*, Feb., 1883.) M. E. W. [604

METEOROLOGY.

Canadian weather-review for February, 1883. — This review has been issued very promptly. It consists of a compilation of items of interest relating to storms, temperature, precipitation, etc., for Canada. The mean temperature was much below the normal, especially in the maritime provinces. At Sydney, C.B., the defect was 7.1°. A very important table is presented, showing the total number of hours of sunshine at thirteen stations of the dominion. Since the well-being of crops is dependent, in large measure, on the amount of sunshine, such records, it would seem, would be of great value. The service finds 71.2 per cent of its probabilities fully verified. Full record is given of the special disturbances of the magnetic needles at Toronto. These show very markedly the intimate relation between the aurora and magnetism, as has been known for many years. Auroras were seen on the 1st, 4th, 22d, and 27th. — H. A. H. [605

State weather-services. — The Ohio weather-service has issued its report for January. This shows an addition of six stations since the November report, there being twenty-five in all at the present time. Thirteen of the stations have barometers. The observations, day by day, are published in full, and will form a more satisfactory basis for more detailed study than can be had from stations at greater intervals.

The Tennessee weather-service has issued its first monthly report for February. This shows that twenty-two stations are now observing the weather, and twenty-eight more are soon to join in the work. It is to be hoped that these stations of observation will not only add to our store of knowledge, but also increase interest in a large mass of people to whom an accurate forecast of the weather is of great consequence. The observation of rainfall, for example, is one of the simplest that can be made, and, all along the watersheds of our rivers, would assist very materially in the discussion of floods, droughts, etc. — H. A. H. [606

GEOGRAPHY.

Reviews. — 'Japans landwirtschaftliche und allgemeinwirtschaftliche verhältnisse,' by Georg Liebscher (Jena, 1882), is reviewed by Alf. Kirchhoff in *Ausland*, 1882, 881–887.

The geographic observations in Nordenskiöld's 'Umsegelung Asiens und Europas auf der Vega' (Leipzig, 1882) are summarized in *Ausland*, 1882, 947–954.

'In fernen osten; reisen des grafen Szechenyi in den jahren 1877–1880,' by G. Kreitner (Vienna, 1881), is reviewed by A. H. Keane in *Nature*, Dec. 21, 1882.

Elwes' translation of Capello, and Ivens' narrative, 'From Benguela to the territory of Yacca' (London, 1822), is noticed by E. C. Rye in *Proc. roy. geogr. soc.*, iv. 701. — W. M. D. [607

(*Africa.*)

Wissmann's letter from Cairo. — Under date of Jan. 5, Wissmann wrote to the German-African association from Cairo, where he was detained by sickness that began on his homeward voyage up the Red Sea. The following abstract notes his more important statements, but his route is difficult to follow from lack of his names on even the most recent maps. Early in December, 1881, Wissmann left Kingenge, with Pogge and a caravan of two hundred men, and, on passing the Lulua, reached the limit of the west African wooded savannahs, and entered the thickly populated prairies of central Africa. Lake Mukamba was reached in the middle of December, in lat. 5° 45′ S., concerning which further details will be given. Passing the populous district of the Bashilange, the explorers came to the Lubi on Jan. 5, 1882, and entered the country of the Bassonge (sing., Mussonge), — a fine, strong, industrious race, living in neat villages, with houses surrounded by gardens, and separated by straight streets shaded by palms and bananas. They work in iron, copper, clay, and wood, and understand weaving and basket-making. Two days' march through forests inhabited by elephants and buffaloes led them to the residence of the king, Katjitch, on the Lubilash (Sankuru), lat. 5° 7′ S., where they rested a week. On starting again, there was some difficulty at first in obtaining permission to go; for the king wished them to stay and help him against an attack from the Bakuba on the north. Leaving the Lubilash on Jan. 29, they crossed a fertile, well-watered region, occupied by warlike Bassonge, by long villages of Benecki (sing., Munecki), and by the timid Kalebue, nearly all of whom are cannibals, and, on March 8, came to the Lomami, lat. 5° 42′. From here to Tanganyika were found the Batua (Stanley's Watwa), who seem to be the remaining tribes of the early people of this region. They live in miserable huts, without industry or agriculture, and subsist on wild fruits and by hunting. On April 17, the party arrived at Nyangwe on the Lualaba, lat. 4° 13′ S., and were well received and aided by the Arabs of that half-civilized town. There the explorers parted. Pogge turned back on May 5; and, after some delay, Wissmann started eastward with a small party on June 1, having much trouble with his men and the people, on the way, till he reached the great lake. There, at Ruanda, he enjoyed the hospitality of the English missionary, Griffith, and made a four days' excursion to the Lukuga, concerning which he promises interesting information as to the part it plays as Tanganyika's outlet. Crossing to Udjidji, the rest of his way led through less unknown country. His most important *détour* was to 'Uhha' (Udjowa?), where King Mirambo received him in the most friendly manner, with roast beef and champagne. On Sept. 5 Wissmann was welcomed to Tabora by the French missionaries there, and shortly afterwards reached the German station in Gonda, where he found Böhm and Reichardt about to start on an extended journey farther inland, Kaiser having already set out. On Nov. 15 he arrived safely on the eastern coast. — (*Ausland*, 1883, 134; *Comptes rendus soc. géogr. Paris*, 1883, 90.) W. M. D. [608

Rio Bembe. — D. T. das Neves prefaces an account of his exploration of this river, generally given as the

Limpopo on the maps, with an historical sketch of the native government of the region, of which Muzila, son of Manicussa, is at present the head. After the Zambezi, the Bembe is the largest river of eastern Africa. Its valley is very fertile, — suitable for the growth of sugar-cane, cotton, etc., — and is well populated. To the northward the country is more healthy for Europeans. Its fine forests of valuable wood contain many elephants, and its saline lagoons are full of hippopotamus; but, "in consequence of the absence of native population, the tsetse-fly is found everywhere through it." In a somewhat exalted peroration, the author concludes with, "We have traversed a vast area of the province of Mocambique, finding it all most salubrious and excellent for occupation by the white race. It possesses all the conditions to make it suitable for the immigration of millions of Europeans, who will find its soil more fertile than that they have left. It is perhaps the most populous region of all tropical Africa; and its millions of natives, placed in contact with civilization, will become consumers of innumerable European wares." — (*Bol. soc. geogr. Lisboa*, 1882, 336.) W. M. D. [609

BOTANY.

Ice-plant (Mesembryanthemum crystallinum). — M. Herve Mangon calls attention to the ease with which this plant can be cultivated on a large scale as a source of potash. According to him, the fresh plant contains about half of one per cent of potash. — (*Comptes rendus*, Jan. 8, 1883.) G. L. G. [610

Loss and gain of nitrogen by arable soil. — M. Dehérain gives a very interesting account of his experiments at the station at Grignon, which may be summarized as follows: the loss of combined nitrogen which a harvested field sustains is not due exclusively to the removal of the crop, but is largely attributable to the oxidation of nitrogenous matter in the soil, and its escape in the form of nitrates in drainage-water. The loss is greatest when the use of fertilizers has been most generous, and it ceases when the fields lie fallow. The reason for the latter is, that then the air penetrates less deeply. The results are quite in accord with those previously reached at Rothamsted. — (*Comptes rendus*, Jan. 15.) G. L. G. [611

Solar radiation, and assimilative activity. — Timiriazeff, whose experiments upon the action of chlorophyll are of great importance, has lately published in a short note a few of his more recent results. Quantitatively determined, forty per cent of the amount of solar energy absorbed by a green leaf under the most favorable conditions is converted into chemical work. He calls attention to the usefulness of Langley's bolometer in such investigations. — (*Comptes rendus*, Feb. 5.) G. L. G. [612

The difference between the chemical constitution of living and dead protoplasm has been further studied by Loew; and the results of the investigation, too complicated for a short abstract here, accord in the main with those previously noticed in this journal. — (*Pflüger's archiv*, Feb. 12.) G. L. G. [613

Fertilization of Yucca. — The deliberate pollination of Yucca-flowers by a tortricid moth (Pronuba), to insure the production of seed for its young to feed upon, is will known through the publications of its discoverer, Prof. Riley. From an abstract of a paper read last summer at the Montreal meeting of the American association, by the same observer, it appears that the act of collecting pollen by Pronuba for the fertilization of the Yucca "is as deliberate and wonderful as that of pollination. Going to the top of the stamen, she stretches her tentacles to the utmost on the opposite side of the anther, presses the head down upon the pollen, and scrapes it together by a horizontal motion of her maxillae. The head is then raised, and the front-legs are used to shape the grains into a pellet, the tentacles coiling and uncoiling meanwhile. She thus goes from one anther to another until she has a sufficiency." The conclusion of Dr. Engelmann, that the apices of Yucca stigmas are not receptive, is confirmed. "The exceptional self-fertilization in Yucca aloifolia, the only species in which it is recorded, is shown to be due to the fact, that, in the fruit of this species, there is no style, the stigma being sessile, and the nectar abundant, filling and even bulging out of the shallow opening or tube. The flowers are always pendulous; and the pollen falling from anthers can, under favorable circumstances, readily lodge on the nectar." — (*Amer. nat.*, Feb.) W. T. [614

Pollination of the fig. — Some light has been thrown on the much-vexed question of caprification, and the relation of the caprifig or Caprificus to the fig-tree, by the studies of Fritz Müller and Paul Mayer. It appears that the caprifig is the male fig-plant, as Linné believed, and not a distinct race, as Solms-Laubach has recently maintained. Fig-seeds produce both Caprificus and fig-seedlings. The relations between these two forms of an originally monoecious species, and the gall-fly (Blastophagus), on which it now relies for crossing, are very curious. Three broods of the insects each year are brought to maturity in as many crops of flowers of the caprifig; the first two of which are absolutely infertile, while the last does not average one seed to two figs. On arriving at maturity, the wingless males, after escaping from the fruit in which they have developed, seek out other pistils containing females, which, being impregnated before their release, afterward escape, and penetrate other young figs belonging to the next crop, on either caprifig or fig-tree, to oviposit. Being dusted with the pollen of the strongly protogynous flowers from which they have come, they pollinate the receptive stigmas over which they creep; but the flowers of the caprifig only are accessible to their ovipositors. As a result of fertilization, the fig-tree ripens its fruit rapidly, and its seeds are soon scattered by frugivorous birds; but that of the caprifig never becomes eatable. — (Müller, *Kosmos*, Aug. 5, 1882; Mayer, *Mittheil. zool. stat. Neapel*, iii.; Abstracts, *Biolog. central-blatt*, Nov. 15.) W. T. [615

ZOÖLOGY.

Coelenterates.

The origin of the spermatozoa in Medusae. — In a short paper on this subject, Merejkowsky calls attention to the interesting fact, that the mature reproduction-follicle of Cassiopea or Rhizostoma bears a close resemblance to the same organ of Pelagia during its very young stages. At a very early stage of development, the immature follicles are almost exactly alike in all three genera; but in Cassiopea they undergo very little change. The mature organ is a simple ovoidal pouch, lined with endoderm-cells, and filled with spermatozoa. According to the brothers Hertwig, Pelagia passes through a similar stage long before maturity is reached; but its development in this genus does not stop here, and it finally becomes a long irregular pouch, the tortuous ramifications of which are interlaced in an inextricable tangle.

It is easy to discern that the simple pouches of

Cassiopea open, when mature, into the genital sinus, into which Merejkowsky has seen the ripe spermatozoa escape. He believes that similar openings probably exist in Pelagia; and he thinks the failure of the Hertwig brothers to find them is due to the great complexity of the mature follicle in this genus, rather than to the absence of openings.

The paper also contains a minute illustrated account of the transformation of the endoderm-cells which line the follicle into spermatozoa. — (*Arch. zool. exp. gén.*, 1882, 577.) W. K. B. [616

Endodermal nervous system in hydroids. — Dr. Lendenfeld states that he independently discovered in Australian species of Eudendrium and Campanularia the ring of glandular cells which has been recently described by Weissman and Jickeli in Eudendrium. He also finds in all the Campanularidae which he has examined a well-developed nerve-ring of endodermal origin, running around the proboscis, just inside the oral opening. In this region a number of sensory cells are found, with stiff hairs, which project among the cilia of the endoderm-cells. The study of sections shows that these sensory cells are connected with the ganglion-cells; and the processes which are given off from these ganglion-cells anastomose with each other in such a way as to form a complete nerve-ring around the mouth. This ring he regards as the central nervous system of hydroids; and he calls attention to the fact that it not only originates from the endoderm, but is without a homologue in the medusae, since none of the medusae are known to have a nerve-ring in this position. — (*Zool. anz.*, Feb. 5.) W. K. B. [617

Crustaceans.

Color in Idotea. — Carl Matzdorff has published an elaborate and fully illustrated memoir on the color of Idotea tricuspidata (= irrorata), — a variously colored isopod abundant on both sides of the North Atlantic. After describing the various color-varieties, which he arranges in five groups, and the minute structure of the integument, particularly the hypodermal pigment-cells, which he regards as true chromatophores, the author discusses at great length the physiology of the changes of color, and the origin of color-varieties. The changes of color are directly influenced, neither by food, temperature, light, nor saltness of the water, but are sympathetic changes induced by the color of the surrounding objects. Warmth and light, however, accelerate, and cold and darkness retard, the color-changes. As in other animals, changes in color are produced by contraction and dilatation of different sets of chromatophores. The synonymy of the species is discussed, and a long list of works cited is given; but Dr. Matzdorff, while agreeing with Harger, that the American irrorata and the European tricuspidata are the same species, rejects the earlier name because it has been used only by Americans! — (*Jena. zeitschr. naturw.*, xvi. 1.) S. I. S. [618

The Challenger Amphipoda. — The Rev. T. R. R. Stebbing gives preliminary descriptions of some of the more striking new forms of Amphipoda from the Challenger expedition. Only nine species and one genus are described. Unfortunately, no allusion whatever is made to the region or depth from which any of the specimens come. — (*Ann. mag. nat. hist.*, March, 1883.) S. I. S. [619

VERTEBRATES.

The reaction time of olfactory sensations. — The time elapsing between the moment of stimulation and the giving of a signal to indicate the perception of a sensation by the person experimented upon, has been measured for auditory, tactile, visual, and gustatory sensations. Beaunis has now added to the list by a series of observations made on himself in regard to the reaction time of olfactory sensations. From the table which he gives, it is clear that stimuli, as ammonia and acetic acid, which excite, not merely fibres of the gustatory nerve, but also nerves of common sensation, have a shorter reaction time than stimuli which act only or mainly on the nerve-fibres concerned with the sense of smell proper. Excluding ammonia and acetic acid, the table includes camphor, assafoetida, ammonium sulphide, chloroform, carbon disulphide, valerian, mint, and carbolic acid; and the reaction time increases in the above order from .50 to .67 of a second. It was found impossible to determine accurately the moment of olfactory perception of musk. The numbers show that the olfactory reaction time is longer than tactile, visual, or auditory.

In a foot-note the author states, that, since writing his paper, he has learned that Buccola of Turin had been, about the same time, at work on the same subject, and had reached results in the main concordant with those above stated. — (*Comptes rendus*, xcvi. 387). H. N. M. [620

Fine structure of bone. — G. Broesike has published an extensive memoir on this subject (*Archiv mikr. anat.*, xxi. 695), of which Eberth has published an abstract, here reproduced. The first part of the paper deals with the limiting-sheaths of the osseous canal system. The sheaths may be isolated by the action of acids on completely macerated bones. They are but slightly pliable, and reproduce perfectly the forms of the canals. They may be destroyed by certain reagents quicker than the basal substance of bone, from which they are therefore different, their substance resembling keratine in the author's opinion. The sheaths are wanting in embryonic and all young bone. The author speculates as to their origin: he thinks they must arise either as a precipitate from the lymphatic fluids, or else by decalcification of the basal substance. (Neither of these views appears probable.) The osseous corpuscles form a continuous network by the union of their processes. These cells probably have no membrane, and the nucleus soon degenerates. With increasing age, the cells loose their process, and become jagged and smaller, so that there is a space around them; then follows fatty metamorphosis of the protoplasm, and finally complete fatty degeneration, of which the products may be resorbed. The author advances the (very improbable) hypothesis, that the corpuscles are killed by smothering in carbonic acid, accumulated in parts of the bone remote from the blood-vessels. The basal substance consists of uncalcified gelatine, yielding fibrillae, embedded in a calcified cement. The lamellae are formed by primitive layers of fibrillae, which do not intercross and intertwine, although the sets of parallel fibrillae run in various directions. The author distinguishes between regular and irregular fibrillar tissue. — (*Fortschr. med.*, i. 10.) C. S. M. [621

Nerves of the small blood-vessels. — L. Bremer gives a brief *résumé* of previous opinions on this subject, and reports his own observations made principally on frogs and lizards. He asserts that his statements also apply to the warm-blooded vertebrates. The fine capillaries are accompanied by usually two naked nerve-fibres, which anastomose with one another, and give off fine branches which form a plexus around the vessel. The threads of the plexus give off fine knot-like thickenings on the side towards the wall of the vessel, and these knots are the ultimate terminations. On the veins and arteries there are

medullated nerves that give off the naked fibres to form the perivascular plexus. Bremer closes his paper with criticisms of previous writers on the subject. — (*Arch. mikros. anat.*, xxi. 663.) C. S. M. [622

Fish.

A pleuronectoid hybrid. — A curious flatfish was sent to Dr. K. E. H. Krause of Rostock, and has been noticed by him as hybrid between the plaice (Platessa vulgaris) and turbot (Rhombus maximus). No figures or descriptions are given to enable the reader to form an opinion for himself. — (*Arch. ver. freunde naturg. Meckl.*, xxxv. 119.) T. G. [623

The bones of Lophius piscatorius. — An article with this caption has been published by Robert Morrow. The bones of the skeleton are described in the sequence followed by Cuvier, but with Owen's nomenclature. The article is deficient in the clearness and precision which could only result from comparison with related forms. — (*Proc. trans. Nova Scot. inst.*, 5, 340.) T. G. [624

Fishes of Wisconsin. — A Catalogue of the cold-blooded vertebrates of Wisconsin has been furnished by Dr. P. R. Hoy to the geological survey of the state. The classification of the first edition of Jordan's manual has been adopted, and a hundred and forty-two species are catalogued. The list is little more than a nominal one, and is replete with typographical errors. It is not evident, either, to what extent the identifications of species can be relied upon, although the author acknowledges "great obligations to Prof. David S. Jordan, as well as to the lamented Copeland, for valuable assistance in determining species." Dr. Hoy thinks that "Wisconsin has, perhaps, the best facilities for fish-culture of any state in the Union," as there are 'not less than 1,800 lakes,' covering 'some 1,400 square miles,' in the state. — (*Rep. geol. surv. Wisc.*, i. 427.) T. G. [625

Mammals.

Development of the lachrymal duct in mammals. — Von Baer referred the development of the lachrymal canal to an evagination of the pharyngeal cavity; Burdach, to a fold in the skin starting from the corner of the eye. The first to assert that it arises as a groove between the upper jaw and external nasal process was Erdl, whose view was shortly after, but independently, advanced by Coste, and since has been widely accepted. Its accuracy became questionable when Born showed (*Morph. jahrb.*, ii.) that the canal arises in amphibians, lizards, and chicks, as an ingrowth from the inner surface of the epidermis. The ingrowing band becomes subsequently constricted, surrounded by connective tissue, and hollowed out into a canal. Ewetzky (*Arch. für augenheilk.*, viii.) found later the same mode of development in cattle.

E. Legal now reports his investigations on this theme, carried out principally on pigs, but also on mice and rabbits. The first indication of the lachrymal canal is at the time when the nasal pits communicate with the mouth by the primitive choanae, and the Jacobson's canal is well developed, — while externally the so-called lachrymal furrow may be seen (pigs, 4.2 cm., extreme length). The epithelium of the lachrymal furrow is thicker than the rest of the epidermis, because there are one or two layers of cells between the basal cylinder and the superficial flat cells, which elsewhere alone constitute the epidermis. The inner surface of the epidermis of the furrow grows into a ridge, which begins at the opening of Jacobson's organ into the nasal cavity. The ridge grows higher, and finally separates from the skin, forming a rod, the separation becoming completed soonest at the nasal end. The upper end of the rod is connected with the upper lid, but soon forms a stout branch, which grows towards, but does not reach, the lower lid of the eye. The details of the growth of the rod are fully entered into. The canalization begins late, and at the ocular end, and is effected by the separation of the central cells of the rod. — (*Morph. jahrb.*, viii. 353.) C. S. M. [626

Morphology of the mammalian germ. — The strange hypothesis is advanced by Repiachoff, that the impregnated ovum of mammals is a distinct individual, which divides into two individuals. One of the descendants only, Van Beneden's 'entodermatic' segmentation-sphere, grows up like a spore into the complete sexual individual. (This seems over-fanciful.) — (*Zool. anz.*, vi. 65.) C. S. M. [627

Harder's glands in rodents. — Karnocki has recently made some studies upon the nature of these structures in rabbits, guinea-pigs, and rats. In rabbits and hares, in contradistinction to all other rodents, the gland consists of two portions, — a superior (white) and an inferior (reddish gray) half, having a common duct. The latter opens near the free border of the eyelid, and, passing backward directly to the gland, divides, giving off many branches to each half. Within the gland the branching increases until the terminal vesicle is reached. The latter consists of proportionally long, broad, and repeatedly branched serpentine passages, with lateral expansions. There is no constriction of the gland proper at its juncture with the duct. This structure distinguishes the Harderian glands of rodents from true acinose glands, and brings them close to the pyloric and other similar glands. The contents of the glands consist of a protoplasmic stroma in which, in the red portion, large fat globules, but in the white portion only small globules, float. The globules in the red portion vary with the age and condition of the animal.

In guinea-pigs the gland corresponds to the red portion in rabbits. The duct is very small, and hard to find. The fat globules of the secretion are of more equal size than in the rabbit. The Harderian glands of rats contain a large quantity of a granular, red coloring-matter, which is not altered by alkalies or dilute acetic acid, but becomes bleached in dilute mineral acids. The red-colored secretion is confined to that portion of the gland outside the lumen, that within being colorless. It contains no large fat globules.

The remainder of the paper is devoted to the histology and embryology of the glands.

The author doubts if the glands of the corner of the eye in other groups of animals, hitherto described as Harderian glands, are in reality such. — (*Proc. Cracow acad.*; abstr. in *Biol. central-blatt*, ii. 709.) F. W. T. [628

The color of horses. — Notes by a large number of observers upon the color of horses in different parts of the globe have been brought together by Dr. Langkavel in a very interesting manner. White and gray horses are, perhaps, the most general favorites; but a great variety of other colors are held in esteem. It is noticeable that black horses are little sought for, except by Europeans. — (*Zoolog. garten*, xxiv. 38.) F. W. T. [629

The baleen whales. — The recently published part of Van Beneden's description of the vertebrate fossils of the vicinity of Antwerp contains a summary of the present knowledge of the geographical distribution, habits and identity, of existing species of baleen whales. Five species of Balaena, four of Balaenoptera, and two of Megaptera, are recognized. — (*Ann. mus. hist. nat. Belg., pal.*, vii.) F. W. T. [630

ANTHROPOLOGY.

India. — In a course of lectures delivered before the University of Cambridge, entitled 'India: what can it teach us?' published by Longmans, London, Max Müller points out some of the manifold lessons which India can teach all students of history, whether religious, political, or social.

The first is of a general and introductory character. The second is meant to remove some of the prejudices which Europeans often entertain against orientals, and, in particular, to show how groundless is the charge of untruthfulness brought against the natives of India. The third dwells on the study of Sanscrit, with regard both to its practical utility and its historical interest. A new chronological division of Sanscrit literature is put forward.

The author claims a high value for the ancient literature, both Vedic and Buddhistic, showing that some of the greatest problems of all times receive an unexpected light from a study of ancient Sanscrit literature. The two phases of human life and human thought presented to us by the Aryans of India on one side, and by the Aryans of Greece, Italy, and Germany, on the other, are contrasted.

The fourth lecture deals with a number of objections which have been raised against the claims of the Veda as the most ancient historical monument of the whole Aryan world.

In the fifth lecture some of the principal lessons which the Veda can teach are explained. The original character of the Vedic gods is discussed. They are divided into three classes, — gods of the earth, air, and sky.

The sixth lecture deals with the god of fire and of the air. Next follows a description of the gods of the highest heaven. The origin of solar myths is shown to be inevitable.

After an explanation of the manner in which the ancient literature of India was preserved by oral tradition, the last lecture is devoted to an analysis of the ancient Vedic religion into its three compound elements, — a belief in the Devas, or the gods of nature; a belief in the Pitris, or the ancestors; and a belief in the Rita, or the law, order, and reason which underlie both the natural and the moral world.

The text of the seven lectures is followed by Notes and illustrations: 1. The treasures found at Mykenae, and their similarity to treasures found on the Oxus; 2. Names of the cat and the cat's eye; 3. Village estates; 4. Venial untruths, according to Indian views; 5. The Yueh-chi; 6. Some letters on Buddhism; 7. Renaissance of Sanscrit literature; 8. Texts illustrative of the deluge in India; 9. Parganya in German; 10. The Pitris, or fathers; 11. Srâddhas, or ancestral worship.

In the note on the renaissance of Sanscrit literature, evidence has been collected in support of the author's theory that the whole of it, with the exception of the Vedic and Buddhistic, is later than the fourth century of our era. Kâlidâsa's plays are relegated to the sixth century, and the Laws of Manu are assigned to a date not earlier, and possibly much later, than the fourth century after Christ. — H. W. H. [631

Iroquois. — Under title of 'Legends, traditions, and laws of the Iroquois,' Eliah Johnson, a Tuscarora chief, engages in the very laudable attempt "to animate a kinder feeling between the white people and the Indians, established by a truer knowledge of our civil and domestic life, and of our capabilities for future elevation." It needs but a cursory examination to show that the manner in which the desired end is to be attained was by no means clear to the writer's mind; and it is not probable that the book will have the success which the evident sincerity and earnestness that pervade it would seem to deserve. Some of the historical facts presented are interesting, and certain of the traditions are of value to the student of ethnology. Under the heading 'Creation' is an interesting Tuscarora tradition, treating of the beginning of the world, and the formation of the celebrated league.

Who were the Squawkihaws, Kah-Kwahs, and the Eries, has always been an enigma; and in answering that the three were formerly known as Squawkihaws, a remote branch of the Senecas, and speaking the same language, the author has done a service to all students who interest themselves in tribal nomenclature and relationships.

The tradition relating to the expulsion of the Squawkihaws, or, as they have been usually called, the Eries, is peculiarly interesting and important, inasmuch as it is stated with all desirable precision, that, after a hot pursuit by the Senecas, a considerable portion of the tribe succeeded in making their escape, and, as was supposed, disappeared in the Far West under a changed name, leaving a large number of prisoners to be adopted into the conquering tribe.

The Jesuit relations contain the generally accepted idea that the Eries were utterly exterminated, — one of the many instances where extermination, so called, really means a comparatively small number killed, and a large remnant incorporated into other tribes. The tribal name, indeed, is lost; but the individual members of the tribe live on under new tribal ties. — H. W. H. [632

The distribution of the Negritos. — M. A. de Quatrefages sends us, in pamphlet form, his paper, which appeared in vol. i. of the *Revue d'ethnographie* (111–161), upon the geographic distribution of the Negritos, and upon their identification with the Asiatic pygmies of Ctesias and Pliny. The author, like Crawford, Pickering, and many others, distinguishes two dark-skinned races in the Australasian and Malaysian area, — the Papuans and the Negritos. The former are large, muscular, and have their crania dolichocephalic and hypsistenocephalic; the latter are short, plump, and brachycephalic or sub-brachycephalic (0.80 and upwards). A few words are devoted by M. de Quatrefages to the former; the bulk of the essay, to the latter. When the Spaniards began to colonize the Philippines, they met in the interior of Luzon, beside the Tagals, of Malay origin, black people, with woolly hair, short in stature, and living in the mountains, to whom they gave the name *Negritos del monte*. The local name was *Aigtas* (Aëtas), 'black.' Under diverse names they are found, either pure or mixed, in the midst of other peoples, from the south-east extremity of New Guinea to the Andaman Archipelago, and from the Sunda Island to Japan. M. de Quatrefages is acknowledged to be the most indefatigable anthropologist in France, and in this monograph, as well as in others relating to the same subject, has thrown much light upon the Negrito race. We must demur, however, to the *a priori* methods employed in the last part of the essay, wherein he adopts the pygmies of the classical writers. — J. W. P. [633

Voyages of Moncatch-Apé. — M. Le Page du Pratz, in his *Histoire de la Louisiane*, tells of a voyage made by Moncatch-Apé, a Yazoo Indian, up the Mississippi and the Missouri Rivers, across the Rocky Mountains, and down the Columbia to the Pacific Ocean. He there ascertained the trend of the coast north-westward, and the existence of the peninsula of Alaska. From his narrative we also learn of white

men, bearded, and carrying fire-arms, not Europeans, coming annually to the mouth of the Columbia to procure dye-woods, and occasionally to carry off slaves. M. de Quatrefages revives this narrative with notes and comments, arriving at the following conclusions: 1. Neither when du Pratz was in Louisiana nor when he published his book was there sufficient geographical knowledge to invent the story told by Moncatch-Apé; 2. The voyage was really accomplished; 3. The truth of Moncatch-Apé relative to waters, productions, inhabitants, etc., renders his story about bearded white men plausible; 4. The agreement of his account of the bearded white men with that of Basil Hall and others, concerning the people of Loo Choo, leads to the presumption that they were speaking of the same people; 5. Therefore, anteriorly to the advent of Europeans, the mouth of the Columbia was visited by this people. It is best always to allow writers to speak for themselves, and to stand or fall on their own merit. But it does seem that the distinguished anthropologist is grasping at a straw. — (*Rev. d'anthrop.*, (2) iv. 593.) J. W. P. [634

The report of Professor Baird. — Although all the matter of the Smithsonian annual report has been in the printer's hands a year, the preliminary portion, or report proper, has just appeared, and the volume, or appendix, still drags its slow length along. Under the guardianship of the Smithsonian institution are to be found several quite distinct enterprises; such as the International scientific exchanges, the Museum of archeology, the National museum, the Fish commission, and the Bureau of ethnology. A full account of the operations in each of these departments will be found in the report of Professor Baird. Here we shall speak of anthropology only. During the year 1881, Mr. S. T. Walker explored Indian mounds and graves in Florida; Judge J. G. Henderson of Illinois completed his investigations of the mounds of that state; Mr. S. B. Evans and Mr. F. A. Ober conducted some explorations in Mexico; Mr. L. Guesde of Guadalupe sends a portfolio of beautiful water-color sketches of West-Indian polished-stone implements, with descriptions; Mr. Nelson adds to his already splendid collection of Esquimaux culture-objects. Mention is made of the following publications: Bransford's Antiquities of Nicaragua, the Annual report of 1880, and Vol. xxiii. of the Contributions to knowledge. The work of the ethnological bureau in 1881 included the explorations of Mr. Cushing, Col. Stevenson, Dr. E. Palmer, Mr. W. J. Taylor, Mr. S. T. Walker, Major Powell, Mr. Mendeleff, Mr. J. K. Hillers, Tichkematse, and George Tsaroff. — J. W. P. [635

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

National museum.

Invertebrate fossils of Brazil. — The museum has received from Museu nacional of Brazil, through Dr. Orville A. Derby, the first set of duplicates of the invertebrate fossils acquired during the recent geological exploration of that country. The collection comprises about seventy species of fossil gasteropods, the greater proportion of which are now being described for the first time, together with other invertebrates equally interesting.

Lectures upon materia medica. — A course of eight lectures upon materia medica, based upon and illustrated by the collection in the national museum, will be delivered by Dr. D. Webster Prentiss. The course will open on the 7th of April, and be continued on consecutive Saturdays. Admission will be by ticket.

Naval bureau of ordnance.

Gunnery. — A series of experiments has been commenced at the Naval experimental battery near Annapolis, Md., with the breech-loading steel rifle recently completed at the South Boston iron-works.

With a charge of 25 pounds of powder, and a projectile weighing 68 pounds, a muzzle-velocity of 1,996 feet per second has been attained, with a pressure in the bore of the gun of but 27,000 pounds per square inch. This gun has a calibre of six inches, a bore fifteen feet in length, and is capable of withstanding an internal pressure of 55,000 pounds per square inch. Considering the conditions of chamber-space (920 cubic inches), length of bore, and weight of projectile, the results are unsurpassed by any hitherto obtained abroad. — J. M. R.

Annapolis, March 21.

Ordnance experiments. — The experiments with the new six-inch rifle have been continued this week by Lieut. Commander W. M. Folger, who is in charge of the experimental battery at this place. Yesterday a projectile weighing 68 pounds was discharged with a muzzle velocity of 2,130 feet per second, the charge of powder being 32 pounds, and the pressure 30,720 pounds per square inch. The velocity was ascertained by means of two Le Boule chronographs working independently, the difference between the results recorded being only a few feet. — J. M. R.

Annapolis, March 23.

Department of agriculture.

Contagious diseases of animals. — The subject of the prevention and cure of contagious diseases of animals has for many years been considered in this country. For a long time, extirpation was resorted to, and with good results; notably in the work of the commission appointed by the state of Massachusetts in 1860, which entirely succeeded in freeing that state of pleuro-pneumonia. Of late years, inoculation or vaccination has been employed with such success abroad, by Pasteur, that we are justified in anticipating the most beneficial results from the prosecution of his methods in this country. Pasteur has been engaged in efforts to establish some law, through the agency of which such diseases as pleuro-pneumonia, charbon, foot and mouth disease, and other diseases of domestic animals, could be controlled and cured. Dr. D. E. Salmon has been pursuing similar experiments under the direction of the department, though necessarily in a more limited way, and has met with such success that he has great faith in the result of the more elaborate and extensive experiments which he is about to undertake in the District of Columbia. Commissioner Loring has determined to place at the disposal of Dr. Salmon the necessary land, buildings, animals, and apparatus, to enable him to make the proper microscopical observations, and to carry on any experiments that will tend to establish some economical method by which our farmers or breeders may control the diseases of their animals. Dr. Sal-

mon is of the opinion that such diseases as Texas fever, charbon, and pleuro-pneumonia, are the results of germs which he has found in his post-mortem examinations, and that it is possible to protect unaffected animals from these diseases by dilute inoculation.

The precautions which the government has taken to prevent the importation of infectious diseases from abroad, by the establishment of quarantine stations, are praiseworthy, and it is of the greatest importance that proper regulations relative to the transportation of infected cattle from place to place should be adopted; but it is manifestly of far greater importance to ascertain the laws which control the diseases themselves, and to discover some cheap and obtainable means by which the farmer can protect his herds when attacked.

PUBLIC AND PRIVATE INSTITUTIONS.

Peabody museum of American archaeology, Cambridge, Mass.

Stone graves of the Cumberland valley. — In what was formerly an extensive cemetery covering several acres, at Brentwood, Tenn., eighty graves which had not been disturbed were opened during explorations the past summer. These graves were made by placing slabs of stone edgewise, forming the sides and ends of the graves; and on these, other flat stones were placed after the body was deposited. The bottoms of these cists were sometimes lined with small stones, but oftener with large potsherds. In some instances the lining was probably of bark. In several of these graves, two or three, and even, in one instance, five bodies were buried. In two graves, besides the skeleton of the person for whom each grave was made, one or two bones were found belonging to a second individual, in such positions as showed that they had been carefully placed in the grave. In one grave containing five skeletons, two of the three adult crania had persistent frontal sutures; and these were the only crania, in all the eighty graves, presenting this peculiarity. One adult skull had an extra suture, dividing the parietal of the left side into two nearly equal portions. This skull was also remarkable for the extreme occipital flattening, and great development of large Wormian bones; also for the absence of the two lateral incisors of the upper jaw, which, if they were ever present, must have been lost early in life, as all signs of the alveoli, or of wide gaps between the teeth, were obliterated. Many bones bearing evidence of simple inflammatory disease, but none of any specific taint, and several showing united fractures, were also found.

The pottery resembles in type that from the Missouri graves, but is, as a whole, of better finish. There were no large and coarse vessels in the graves, although the large fragments of thick pottery with which the bottoms of many graves were lined show that large vessels were made. The pottery from the stone graves consists principally of water-bottles of various shapes, small food-dishes, and bowls. Some of these are ornamented by incised lines, and others by designs in colors. Among the stone implements found were a large and finely polished celt of chert, several long chipped points with serrated edges, and a few arrow-heads, one of which was found embedded in a dorsal vertebra of the skeleton in the grave. Several implements and ornaments made of bone were obtained, among them two long bone pins with large, flat heads, — both found close to skulls, suggesting that they were probably used for hair-ornaments; also a number of shell and terra-cotta beads, and a single carved disk of shell, resembling those previously found in the stone graves of the Cumberland valley; together with a clay pipe having an ornamental bowl. Only eight pipes have previously been obtained in the several thousand graves which have been explored for the museum. Of these eight, three were of pottery, and the rest of different kinds of stone; one of the latter was elaborately carved, representing a man holding a cooking-pot which formed the bowl of the pipe.

An interesting discovery was made in the cemetery near the top of the hill, which at this place had gradually been gullied, and disclosed a mass of charcoal. On removing with a trowel all the earth about the charcoal, it proved to be the remains of burnt logs. A man was kept at work for several days following out the lines of charcoal and burnt clay; and after a time he succeeded in bringing to light, from under a few inches of clay, the charred floor-beams of a wooden structure of some sort. Within the enclosure formed by the charred logs were discovered a bed of ashes, a number of fragments of pottery, one perfect dish identical in character with those found in the stone graves near by; also a few burnt bones, two small discoidal stones, and two discoidal pieces of pottery. The logs had been supported by clay, which partly covered them, and thus prevented their total destruction when the building, of whose floor they formed a part, was destroyed by fire. About ten feet in length and five in width of this structure were traced, of which a drawing was made before any thing was disturbed. While stone graves were found on all sides, and within ten to twenty feet of the site of this structure, none were discovered under it; and there seems no reasonable doubt that these charred logs were the remains of a wooden structure of the period of the stone graves.

NOTES AND NEWS.

— In continuation of the work of establishing and verifying secondary meridians of longitude, Lieut.-Commander F. M. Green, assisted by Lieut.-Commander C. H. Davis and Lieut. J. A. Norris, U.S.N., under the direction of the Bureau of navigation, has determined a chain of geographical positions, commencing at Madras, in British India, and extending through the China and Japan Seas to Vladivostok, in Siberia. The stations occupied were Vladivostok, Yokohama, Nagasaki, Shanghai, Amoy, Hong-Kong, Manila, Cape St. James, Singapore, and Madras.

In measuring differences of longitude, the method adopted was in all cases to establish portable observatories in each of the two places between which the measurement was to be made, connecting the observatories with the telegraph-offices by short lines; so that the two observers were in telegraphic communication with each other. The errors of the chronometers on local time were then determined by means of numerous star-transits, and the chronometers were compared by repeated telegraphic signals sent both ways over the cable. The latitudes were determined by zenith telescope observations of pairs of well-determined stars.

A full account of the work, with details of the observations and computations, has been prepared, and will be published by the U. S. navy department.

— The seventeenth annual course of lectures to mechanics at the Sheffield scientific school, New Haven, Conn., just completed, embraced the following subjects: The Luray caverns as seen by electric light, Rev. H. C. Hovey; The transit of Venus, Professor Newton; Modern fiction, Mr. Charles Dudley Warner; Photo-chemistry of the retina, Prof. R. H. Chittenden; The trades-unions of the middle ages, Professor Farnam; The history of Connecticut as illustrated in the names of its towns, Professor Franklin B. Dexter; Domestication of animals, Prof. W. H. Brewer; Heat and work (two lectures), Prof. A. Jay Du Bois; The Veda, Prof. W. D. Whitney; Facts illustrative of the Darwinian theory, Prof. A. E. Verrill; The agency of insects in the fertilization of flowers, Dr. E. H. Jenkins.

— The Woman's education association of Boston has made arrangements with Professor George L. Goodale and Dr. W. P. Wilson for a course of ten lectures upon the relation of plants and animals to food. The course is now in progress, on Tuesdays and Fridays, at 11 A.M., in the lecture-room of the Boston society of natural history, having begun on Tuesday, March 27.

— *The American* reports that the Virginia board of education has accepted the Griffin farm, near Petersburg, as the site for the Colored normal and collegiate institute, provided the city council of Petersburg will give five thousand dollars. The college building will be erected near the spot where the memorable 'crater' fight occurred during the war; and the amount appropriated by the legislature for the establishment of the school is one hundred thousand dollars.

— "It is expected," says *Nature*, "that the French government will take in hand the celebration of the centenary of the discovery of balloons. The two committees which had been formed by several aeronautic societies have been amalgamated, and M. Gaston Tissandier has been appointed president. The scheme of an international exhibition for balloons and instruments used in aerial investigations has been adopted by M. Herrisson, the minister of public works, and will be carried into effect by M. Armengaud Jeane, the well-known civil engineer."

— A meeting of the U.S. naval institute was held at Annapolis, March 28, to consider the prize essay for 1883. The subject was, "How may the sphere of usefulness of naval officers be extended in time of peace with advantage to the country and the naval service?" The prize, consisting of a gold medal, one hundred dollars, and a life-membership, was awarded to Lieut. C. G. Calkins, while the essays of Commander N. H. Farquhar and Commander A. P. Cooke received honorable mention. The judges of the relative merits of the essays were Ex-Gov. Alexander H. Rice, Rear-Admiral George H. Preble, and Judge Josiah G. Abbot.

— At the meeting of the Biological society of Washington, March 30, Mr. Newton P. Scudder read a paper on The length of the hatching-period of the domestic fowl, and was followed by Dr. Thomas Taylor, on Section-cutting and mounting of hard woods, and A new parasite in fowls, of the nature of Trichina; Prof. J. W. Chickering, jun., on Mount Kataadn; Prof. L. F. Ward, on Hybrid oaks of the District of Columbia. During the meeting there was an exhibition of specimens (limited to five minutes each), illustrating accidents to animals, by Mr. F. A. Lucas; the bones of the sea-cow (Rhytina), by Mr. F. W. True; another jumping-seed, Remarks on beefly larvae and their singular habits, A burrowing butterfly larva, — by Prof. C. V. Riley.

— Rev. R. W. Logan, missionary of the American board of missions at Ponape, Micronesia, states that the remains of buildings, etc., represented to be found at Ponape, are simply basaltic columns such as are found at Staffa. There is no mark of their having ever been used for buildings, and they bear neither inscriptions nor other sculptures.

— The third annual exhibition of the society of American taxidermists will be held in New York, opening to the public at Lyric Hall, 723 Sixth Avenue, on May 1, and continuing five days. The general meeting will also be held during the same week. Since the Boston exhibition, the society has nearly doubled its membership; and the exhibits entered for New York give promise of a very extensive and attractive display. Inasmuch as this organization has for its special aim the improvement of museum taxidermy, in which there is certainly wide room, its work is an important one, and of great interest to all who visit our American museums.

— The English national smoke-abatement institution is making arrangements for opening a permanent exhibition in a central part of London. It will be free to the public. A hall for the reading of papers and the instruction of classes will be provided; also testing-rooms for the continuation of the series of tests and trials commenced in connection with the South Kensington and Manchester smoke-abatement exhibition of 1882. Particulars may be obtained at the offices of the national smoke-abatement institution, 44 Berner's Street, Oxford Street, London, W. —

— S. E. Cassino & Co. of Boston announce a revised translation of Haeckel's letters of Indian travel, by J. S. Kingsley; The history and uses of limestones and marbles, by S. M. Burnham; A handbook of entomology, by C. V. Riley; and Tables for the use of students and beginners in vegetable histology, by D. P. Penhallow.

— The treasurer of the Balfour memorial fund acknowledges the following subscriptions: Dr. R. H. Fitz, Harvard medical school, $10; Professor Asa Gray, Harvard, $5; Prof. H. P. Bowditch, Harvard medical school, $5; medical classes, '83, '84, '85, Univ. of Michigan, $23.25; previously acknowledged, $423.

—The Bureau of ethnology has just received a copy of Duruy's photographic reproduction of the Maya Codex, known as the 'Manuscript dit Mexicain, or Codex peresianus.' According to Dr. Brinton, only ten copies of this work were issued, one of which is in his library. The one received by the bureau is, therefore, the second which has found its way to this country.

—The more prominent geographers deceased in the year 1882 are: Antinori, known for his travels in Africa; Crevaux, supposed to have been killed by Indians while descending the Pilcomayo; Darwin, who began his great work by a voyage around the world; Delitsch, most widely known as editor of Aus allen welttheilen; Desor, whose work was chiefly geological, in Switzerland and this country; Gill, an explorer of inner China, massacred with Palmer, by the Arabs on the Sinai peninsula; Lütke, the Russian navigator; Parish, author of works on the Argentine Republic; Petherick, an early explorer of the upper Nile; Nain Singh, the most celebrated traveller of the Indian pundits; Rawson, a member of the recent English arctic expedition under Nares, who died from wounds received at Tel-el-Kebir; Rodgers, of our navy, an explorer of the northern Pacific and Arctic; H. v. Schlagintweit-Sakünlünski, one of the three brothers widely known for their explorations in the Alps, and later in India and central Asia; Wyville Thomson, chief of the scientific staff of the Challenger; and Warren, of our engineer department.

—The zoölogical gardens at Cincinnati seem to be in a flourishing condition. The receipts for 1882 were nearly $50,000 ($3,418 in excess of expenditures), of which nearly $30,000 came from gate-money. The animals on exhibition numbered nearly 800; and among those bred in the garden during the year were grizzly bears, the zebu, the bison, and half a dozen kinds of deer.

—In Science, p. 266, column 1, line 8, for 'dollars' read 'shillings.'

RECENT BOOKS AND PAMPHLETS.

Behrens, Wilhelm. Hilfsbuch zur ausführung mikroscopischer untersuchungen im botanischen laboratorium. Braunschweig, *Schwetschke*, 1883. 12+398 p., illustr. 8°.

Boudet de Paris, M. Des applications du téléphone et du microphone à la physiologie et à la clinique. Paris, *Henry*, 1880. 11+171 p. 8°.

Brass, Arnold. Zur kenntniss der eibildung und der ersten entwicklungsstadien bei den viviparen aphiden. Halle, *Schwetschke*, 1883. 40 p., illustr. 8°.

Cavallero, Agostino. Le macchine a vapore, il materiale e l'esercizio tecnico delle strade ferrate: termo-dinamica-aerodinamica. Forino, *tip. Camilla e Bertolero*, 1883. 24+705 p., illustr. 8°.

Claparède, Alexandre. Quelques nouvelles kétones aromatiques obtenues par condensation moléculaire. Dissertation présentée à la faculté des sciences de l'université de Genève. Genève, *Georg*, 1882. 63 p. 8°.

Compagnie internationale des téléphones. Situation des réseaux téléphoniques. Paris, *Dupont*, 1883. 53 p. 4°.

Deutsche botanische gesellschaft. Berichte. i. heft. Berlin, *Bornträger*, 1883. 56 p. 8°.

Duclau. La science vulgarisée. L'éclairage au gaz et la lampe de sûreté, leçons populaires mises au niveau de la science moderne. Limoges, *Ardant*, 1883. 143 p. 8°.

—— *The same.* Les cristaux et la cristallisation. Limoges, *Ardant*, 1883. 144 p. 8°.

Entomological papers from the transactions of the Iowa state horticultural society for the year 1882. Des Moines, *Mills pr.*, 1883. 42 p. 8°.

Filachon, J. E. Principes de cosmologie. Paris, *Durand et Pedone-Lauriel*, 1883. 87 p., illustr. 12°.

Girard, M. Les insectes. Traité élémentaire d'entomologie. Tom. iii. fasc. i. Hyménoptères térébrants; macrolépidoptères. Paris, *Baillière*, 1883. 640 p., illustr. 8°.

Godefroy-Lebeuf et Bois. Les plantes vivaces de la maison Lebeuf, ou Liste des espèces les plus intéressantes cultivées dans cet établissement, avec quelques renseignements sur leur culture, etc. Argenteuil, *Godefroy-Lebeuf*, 1883. 180 p., illustr. 18°.

Graham, R. Algebraic factors: Resolution of elementary algebraic expressions into simple factors by easy methods; with numerous examples and exercises. Dublin, *Pousonby*, 1883. 100 p. 12°.

Grégoire, L. Nueva geografia universal. Traducida y ampliada por D. Nicolas Estevanez. Tom. i. Paris, *Garnier*, 1883. 8+799 p., illustr. 4°.

Guvard, S. Melanges d'assyriologie, notes de lexicographie assyrienne, suivies d'une étude sur les inscriptions de Van. Paris, *Maisonneuve*, 1883. 2+148 p. 8°.

Jouffret, E. Introduction à la théorie de l'énergie. Paris, *Gauthier-Villars*, 1883. 200 p. 8°.

Klein, D. Sur les acides borotungstiques. Paris, *Gauthier Villars*, 1883. 87 p. 4°.

Krieg, Otto. Die dobschauer eishöhle u. gletscherspuren im Riesengebirge. Vortrag in der aula d. gymnasiums zu Hirschberg am Jan. 22. Hirschberg, *Richter*, 1883. 30 p. 8°.

Kruger, Paul. Rotations-und pendelbewegung eines körpers in einer flüssigkeit. Inaugural dissertation. Danzig, 1882. 42 p. 8°.

Martin, H. N., *and others.* Lectures delivered to the employees of the Baltimore and Ohio Railroad Company, by Prof. H. Newell Martin and Drs. Henry Sewall, William T. Sedgwick, and William K. Brooks. Baltimore, *Friedenwald pr.*, 1882. 98 p., illustr. 8°.

Meyer, Lothar, u. **Seubert**, Karl. Atomgewichte der elemente aus den originalzahlen neu betrachtet. Leipzig, *Breitkopf & Härtel*, 1883. 10+245 p. 8°.

Moncel, Count Th. du. Elements of construction for electro-magnets. Translated from the French by C. J. Wharton. London and N. Y., *Spon*, 1883. 90 p. 8°.

Munker, J. G. Grundsätze der electrodynamik, synthetisch hergeleitet u. experimental geprüft. Nürnberg, *v. Ebner*, 1883. 4+27 p., illustr. 8°.

New Jersey—Geological survey. A topographical map of a part of northern New Jersey, from surveys and levellings made and local surveys corrected by George W. Howell and C. C. Vermeule upon a projection made by the U. S. coast and geodetic survey. *Bien, lith.*, 1882. Scale, 1 m. to 1 in. 87.5×88.5 cm.

Orchauski. Recherches craniologiques sur une série de crânes d'assassins. Paris, *Hennayer*, 1883. 13 p. 8°.

Reade, A. A. Study and stimulants; or, the Use of intoxicants and narcotics in relation to intellectual life as illustrated by personal communications on the subject from men of letters and science. Manchester, *Heywood*, 1883. 204 p. 8°.

Sbriziolo, Marco. Trattato di chimica analitica qualitativa e quantitativa. Napoli, *Eschera*, 1883. 374 p. 16°.

—— Trattato di chimica generale inorganica ed organica, esposto sotto il punto di vista della dottrina moderna. Napoli, 1883. Illustr. 8.°

Schiaparelli, G. V. Misure di alcune principali stelle doppie di rapido movimento orbitale. Milano, *tip. Lombardi*, 1883. 43 p. 8°.

Science nouvelle (La). Red. Adolphe Bitard. 1re ann. no. 1, Mars 15. Paris, 1883. 8 p., illustr. 8°. *w.*

Seaton, A. E. A manual of marine engineering: comprising the designing, construction, and working of marine machinery. London, 1883. 446 p., illustr. 8°.

Ulmi, K. Populäre mittheilungen über heizung und ventilation. Mit vorschlägen zur einführung der antiken heizungs-und ventilationsmethode, zum gebrauch für hausbesitzer, anstaltsvorsteher, und bauhandwerker. Bern, *Krebs*, 1883. 144 p. 8°.

United States geological survey. Bulletin No. 1. Washington, *Government*, 1883. 42 p., 2 pl. 8°.

Vicentini, Giuseppe. Gli elettromagneti. Roma, *tip. Cecchini*, 1882. 45 p. 8°.